APPAREL PRODUCTION PLANNING, SCHEDULING AND QUALITY CONTROL

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Unit -1

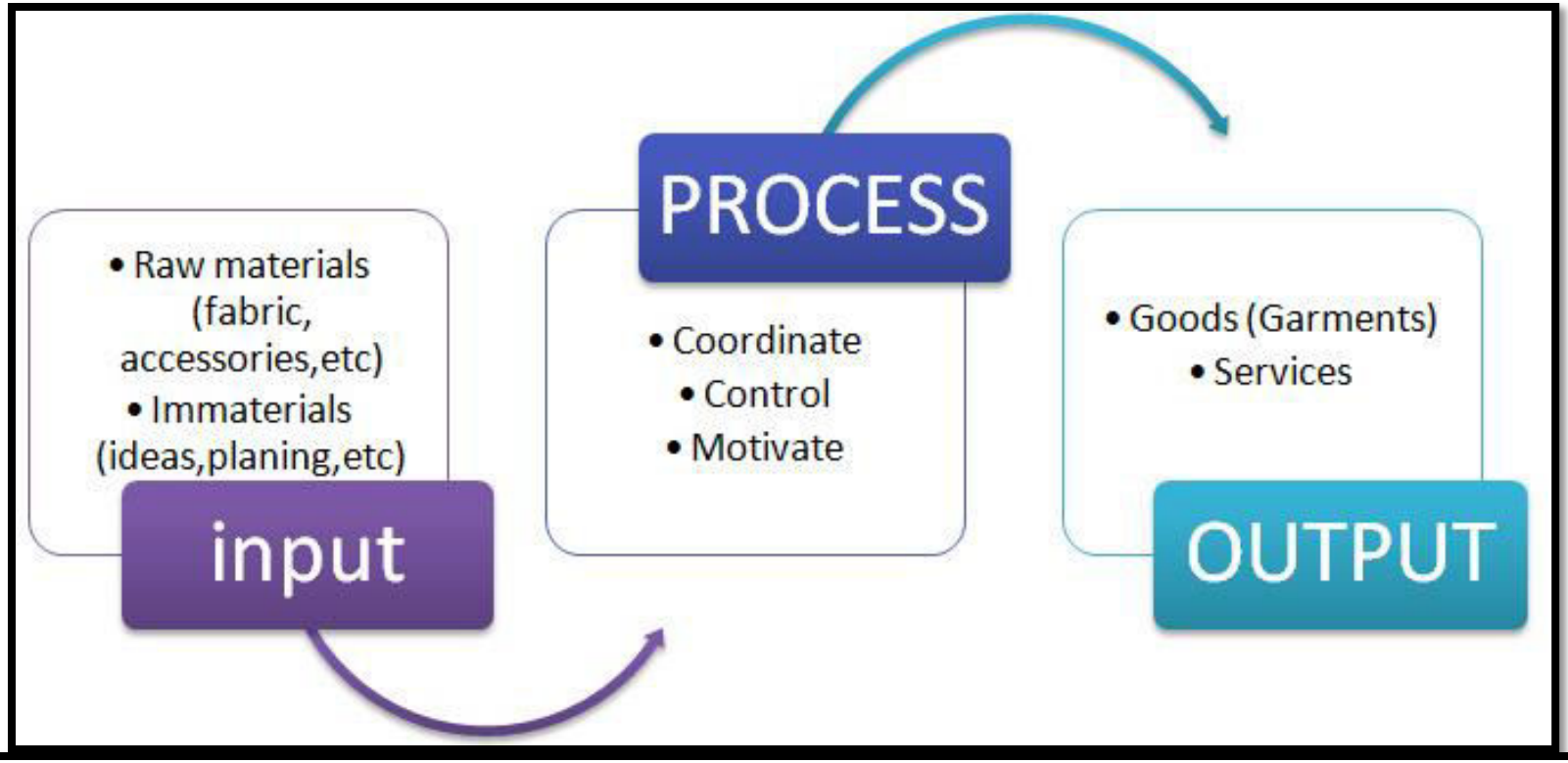
Apparel Production;

Definitions of – production, productivity, efficiency, WIP, inventory, bottleneck, pitch and line balancing; apparel production types- Progressive Bundle system (PBS) Modular Production System (MPS) and Unit Production System (UPS)

Production

- Production is the foundation on which every organization is build. Production and marketing of goods and services are the fundamental objectives of an organization.
- Production is the process of making or manufacturing goods and products from raw materials or components. In other words, production takes inputs and uses them to create an output which is fit for consumption – a good or product which has value to an end-user or customer.
- The processes used to transform material inputs (raw materials, semi-finished goods, sub-assemblies) and immaterial inputs (plans, ideas, information, knowledge) into goods or services.

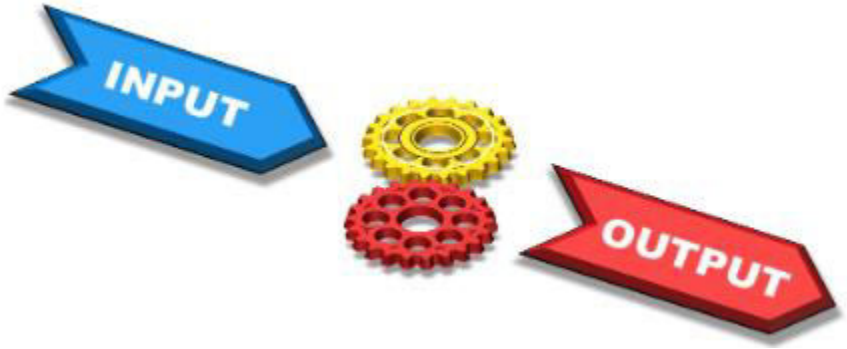
Basically resources are used in this transformation process is to create goods or services which has value and contribute to the utility of individuals or groups.

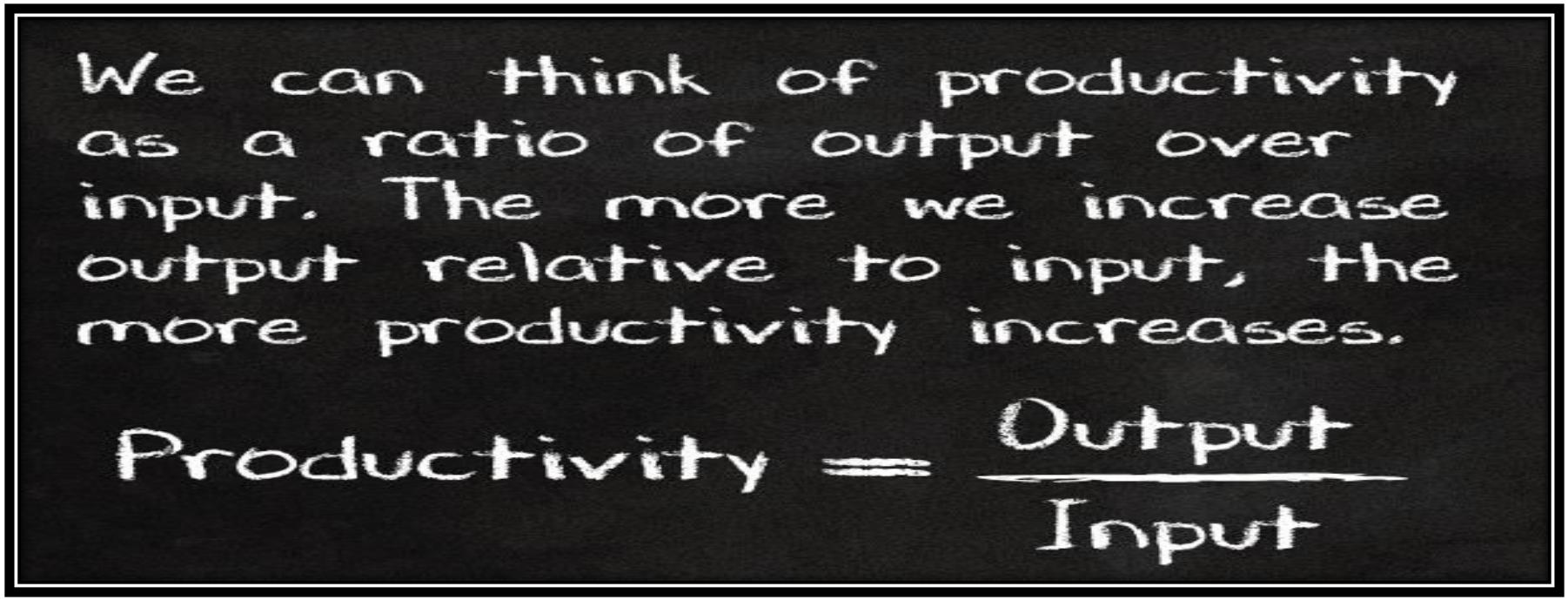


INPUT		PROCESS		OUTPUT
Fiber	⟹	Spinning	⟹	Yarn
Yarn/ filament	⟹	Weaving	⟹	Fabric
Raw fabric	⟹	Printing/dying	⟹	Printed/dyed fabric

Productivity

- Productivity is a measure of economic performance that compares the amount of goods and services produced (output) with the amount of inputs used to produce those goods and services.
- Productivity refers to doing the work in a shortest possible time with least expenditure on inputs without sacrificing quality and with minimum wastage of resources





At what levels can productivity be measured?

Individual worker's productivity

Company's productivity

Industry or sector productivity

Business sector productivity

National productivity

Productivity Improvement Techniques

Efficiency

- The term efficiency can be defined as the ability to achieve an end goal with little to no waste, effort, or energy
- Efficiency is measured for individual operators, for each lines and overall factory efficiency.
- Efficiency is the ratio of total minutes produced and total minutes worked by an individual operator, or a line. Efficiency is expressed in percentage. For example, stitching line efficiency of a typical stitching line is 56%

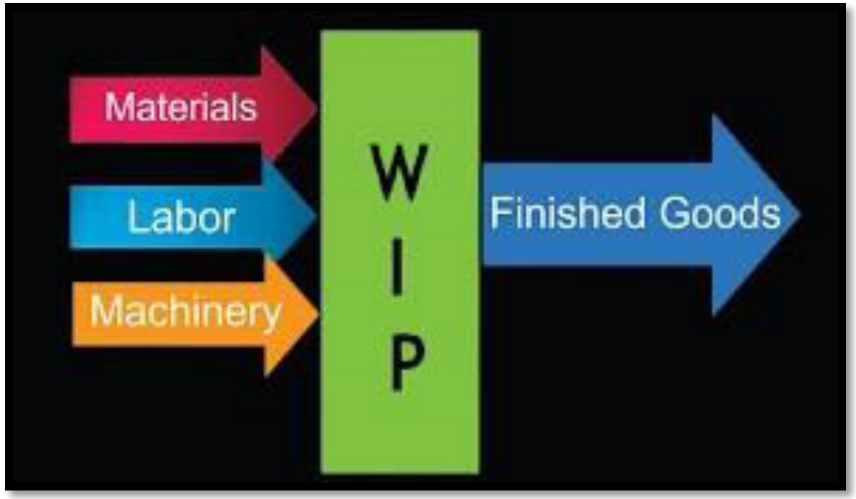
Efficiency = (Total Minute produced / (Total hours worked*60))*100

Work in progress (WIP)

https://www.youtube.com/watch?v=HKQfIcpKI-4

- WIP also called work in process, is **inventory that has begun the manufacturing process and is no longer included in raw materials inventory, but is not yet a completed product**.

On a balance sheet, work in progress is considered to be an asset because money has been spent towards a completed product. Because the product has not been completed, however, WIP is valued lower.



Inventory

- A stock of item held to meet future demand.
- Inventory means the stock of the product of a company and
- It is a physical stock of item a business or production organization kept in hand for the efficient running of business or its production.

Inventory

In a general Sense, it means stock of goods available or held for sale in the ordinary course of business

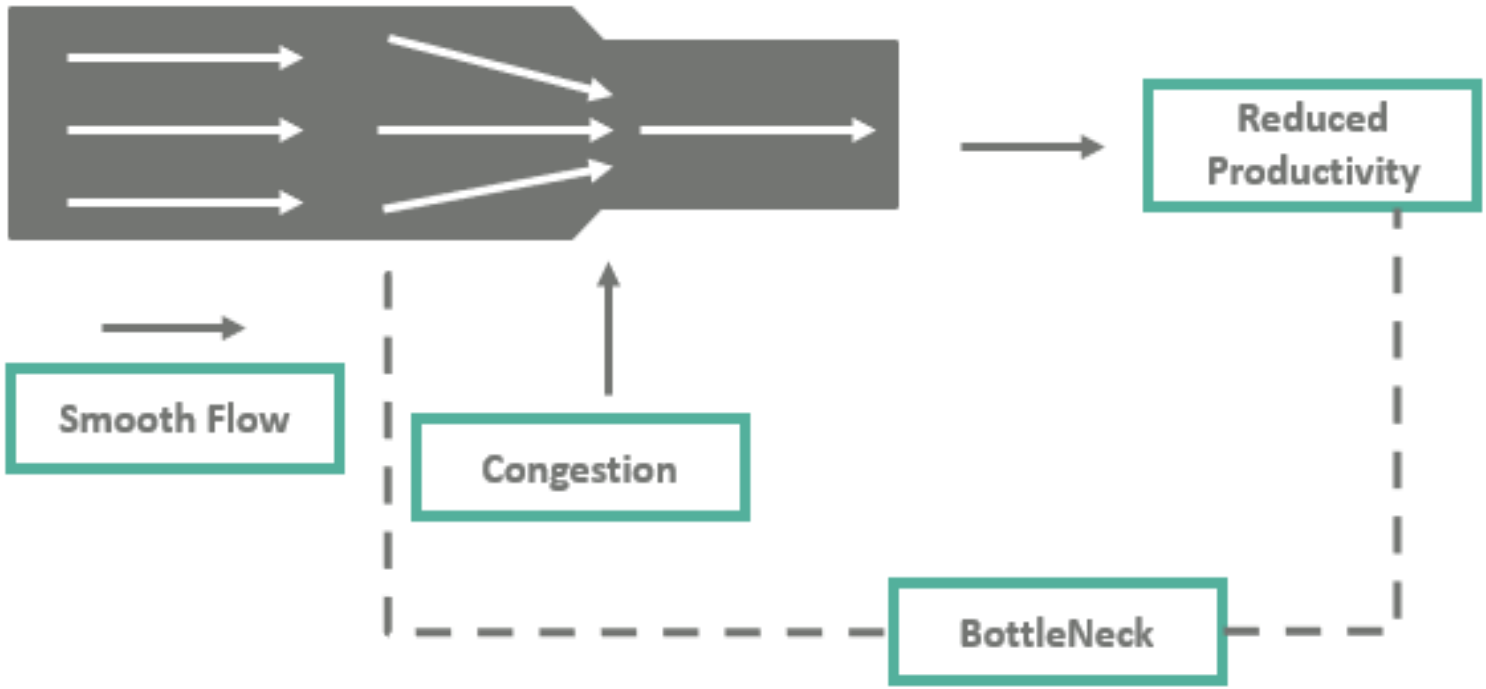
In a business sense, it includes raw-materials stored in warehouse, work-in-progress in production, and finished goods available for sale.

In an academic sense, it means the stock of goods which have demand and supply in the market and can be easily realized in cash

Bottleneck

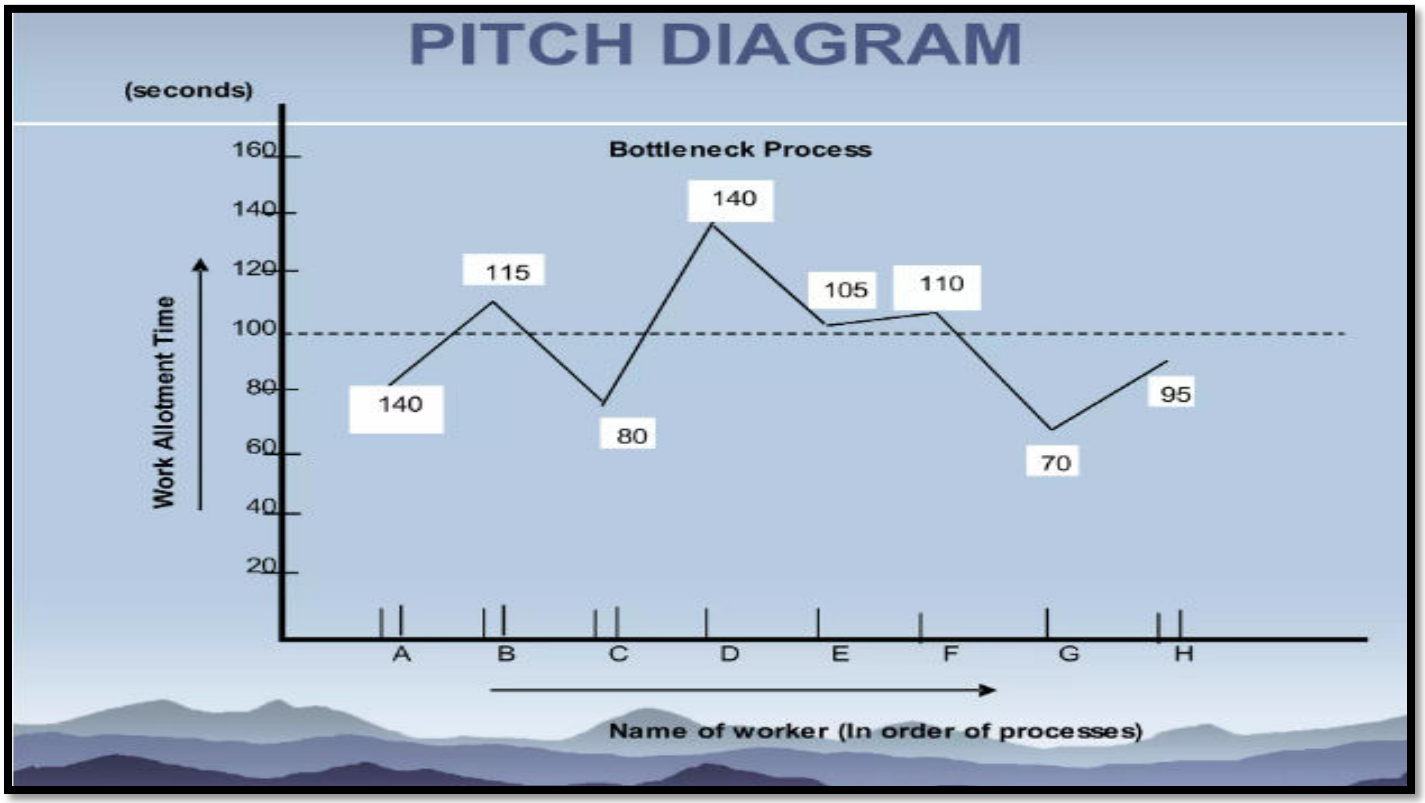
- A bottleneck is a place where a road becomes narrow or where it meets another road so that the traffic slows down or stops, often causing traffic jams. 2. countable noun. A bottleneck is a situation that stops a process or activity from progressing.
- The component is sometimes called a bottleneck point. The term is metaphorically derived from the neck of a bottle, where the flow speed of the liquid is limited by its neck.
- Bottlenecks are periods of very low population size or near extinction. This is another special case of genetic drift.
- The result of a population bottleneck is that even if the population regains its original numbers, genetic variations is drastically reduced

Bottleneck Meaning



Pitch time

Reference value for synchronization in the division of labor is called Pitch Time (PT). Pitch Time provides average time allotted to each worker.



Line Balancing

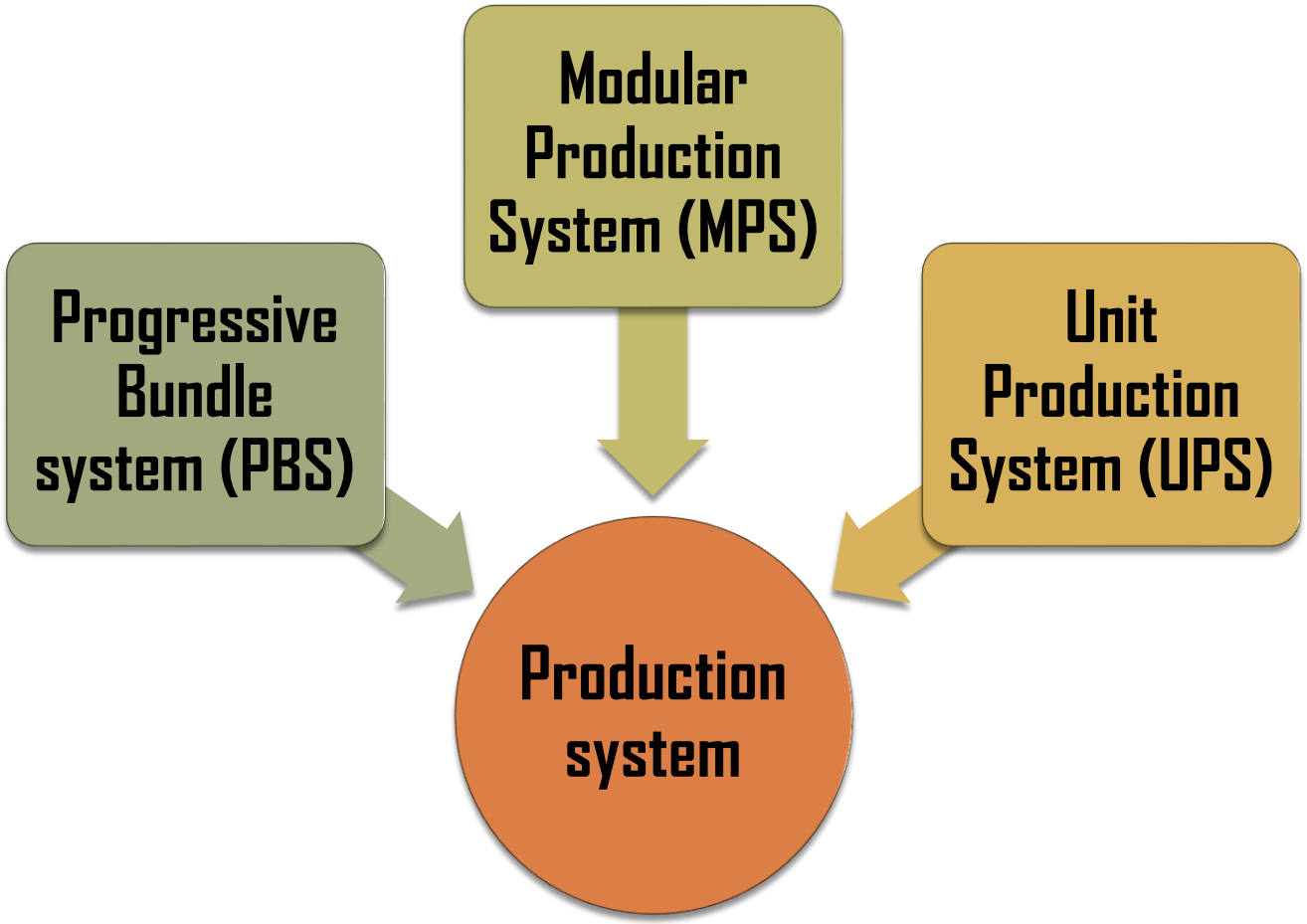
- Line balancing is a production strategy that involves balancing operator and machine time to match the production rate to the takt time. Takt time is the rate at which parts or products must be produced in order to meet customer demand.

$$\text{Takt time} = \frac{\text{Available working time per shift}}{\text{Rate of customer demand per shift}}$$

- Assigning each task to a work within an assembly line in order to meet the required production rate and to achieve a minimum amount of idle time.
- Line balancing is the procedure in which tasks along the assembly line are assigned to work station so each line has approximately same amount of work.

Apparel Production

- Production system is the framework within which the production activities take place.



- Garment production system is a combination of production processes, materials handling, personnel and equipment that direct workflow and produce finished garments.

It is a system that depicts how the two-dimensional fabric is transformed into a three-dimensional garment in a manufacturing system.

- Any production system has four primary factors that make up the system.

Processing time + Transportation time + Temporary storage time + Inspection time = Total Production Time.

Progressive Bundle system (PBS)

The progressive bundle system is a traditional production system that has been widely used in the apparel industries for many decades and still is today. In this system bundles of garments parts are moved in sequence from one sewing machine operator to the next. Each worker receives a bundle of unfinished garments and performs a single operation on each garment in the bundle. After finished of his/her work on a bundle, they are re-tied the bundle and passed on to the next operator. Each PBS task is given a target time or "SAM" (Standard Allowed Minutes).

Time study engineers calculate the SAM for an entire garment for an experienced worker as the sum of the number of minutes required for each operation in the production process, including allowances for worker fatigue, rest periods, personal time and so on.

The success of PBS depends on how the production system is set up and used in a plant.

Modular Production System (MPS)

Modular production system involves a group of 4-17 people who set their own standards and work together to produce a finished garment. They work as a team or module and each team member works on more than one operation. In this system, operators help each other to finish the garment quickly and the team is fully responsible for the production and quality.

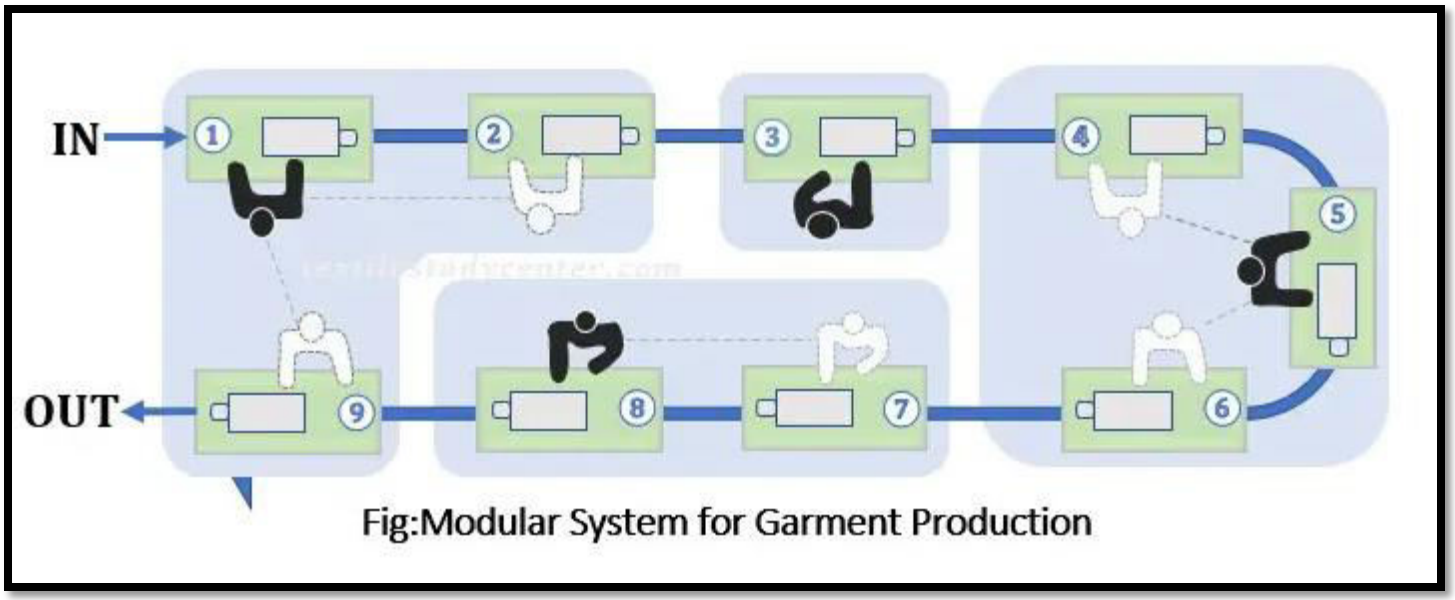


Fig:Modular System for Garment Production

The number of teams in a plant varies with the need of the industry, size of the industry and product line in garments. This system MPS is the perfect solution for the apparel manufacturer where quick response is needed. This system is also popular as a Cellular Garment Manufacturing, flexible workgroups or Toyota Sewing System (TSS).

Unit Production System (UPS)

The unit production system (UPS) for apparel industries is a flexible material handling system that requires a computerized overhead transportation system to move the garment components automatically from one workstation to the next according to a pre-determined sequence.

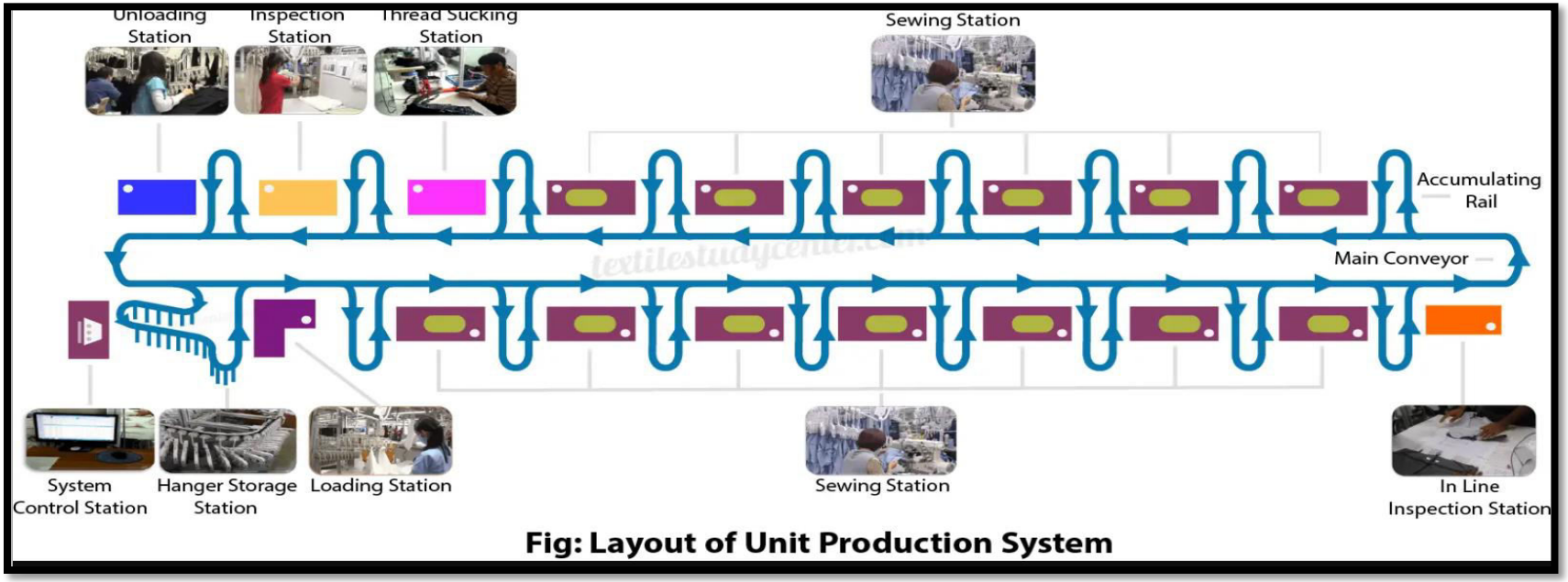


Fig: Layout of Unit Production System

It replaces the traditional garment production system of handing, bundling, tying and untying, and manually moving garment parts. It provides uninterrupted workflow to the workers and helps to improve work efficiency and product quality. In the fast-moving fashion and apparel industry, this is highly essential.

QUESTIONS.....

- Find the odd one out

a) Production b) productivity

b) Efficiency d) quality

- Which is fastest production system among following

a) PBS b) MPS

b) UPS d) NONE

- Which produces best quality among following production system:

a) PBS b) MPS

b) UPS d) NONE

Very Short question

- Define production
- Define productivity
- Expend PBS
- Expend WIP

Short question

- List the features of PBS
- Write a short note on line balancing
- Discuses about bottle neck

Unit -2

Production Planning and Control (PPC)

PPC-Meaning, Objective, Procedure and Elements (Material, Method, Machine, Manpower, Routing, Estimating, Loading, Scheduling, Dispatching, Inspection, Evaluating and cost control)

Production Planning and Control (PPC)

Production planning and control (PPC) department is one of the most important departments in garment manufacturing industry.

Production Planning and control is the organizing and planning of the manufacturing process.

Production Planning and Control is defined as planning and coordination of firm's materials and physical facilities to achieve predetermined production goals in most economical manner.

OR

"Production planning and control is the co-ordination of series of functions according to a plan which will economically utilize the plant facilities and regulate the orderly movement of goods of all materials to the shipping of finished goods at a predetermined rate"


Materials
Follow-up
Methods
Capacity planning
Machine & manpower
PPC
Expediting
Routing
Inspection
Estimating
Dispatching
Loading & scheduling

Objectives of Production Planning and Control

Production planning and control ultimately aims to increase productivity through efficiency enhancement while also being economical.

Increased productivity is successfully achieved through optimizing the use of existing production resources and labor resources while eliminating wastage/spoilage of materials.

Objectives of Production Planning and Control

1. **Effective utilization of resources**

Production planning results in effective utilization of resources, plant capacity and equipment. This results in low-cost and high returns for the organization.

2. Steady flow of production

Production planning ensures a regular and steady flow of production. Here, all the machines are put to maximum use. This results in a regular production, which helps to give a routine supply to customers.

3. Estimate the resources

Production planning helps to estimate the resources like men, materials, etc. The estimate is made based on sales forecast. So production is planned to meet sales requirements.

Objectives of Production Planning and Control

4. Ensures optimum inventory

Production planning ensures optimum inventory. It prevents over-stocking and under-stocking. Necessary stocks are maintained. Stock of raw material is maintained at a proper level in order to meet the production demands. Stock of finished goods is also maintained to meet regular demands from customers.

5. Coordinates activities of departments

Production planning helps to coordinate the activities of different departments. For e.g. the marketing department coordinates with production department to sell the goods. This results in profit to the organization.

6. Minimize wastage of raw materials

Production planning minimizes wastage of raw materials. It ensures proper inventory of raw materials and materials handling. This helps to minimize wastage of raw material. It also ensures production of quality products or goods. This results in a minimum rejects. So proper production planning and control results in minimum wastage.

Objectives of Production Planning and Control

7. Improves the labor productivity

Production planning improves the labor productivity. Here, there is maximum utilization of manpower. Training is provided to the workers. The profits are shared with the workers in form of increased wages and other incentives. Workers are motivated to perform their best. This results in improved labor efficiency.

8. Helps to capture the market

Production planning helps to give delivery of goods to customers in time. This is because of regular flow of quality production. So the company can face competition effectively, and it can capture the market.

9. Provides a better work environment

Production planning provides a better work environment to the workers. Workers get improved working conditions, proper working hours, leave and holidays, increased wages and other incentives. This is because the company is working very efficiently.

Objectives of Production Planning and Control

10. Facilitates quality improvement

Production planning facilitates quality improvement because the production is checked regularly. Quality consciousness is developed among the employees through training, suggestion schemes, quality circles, etc.

11. Results in consumer satisfaction

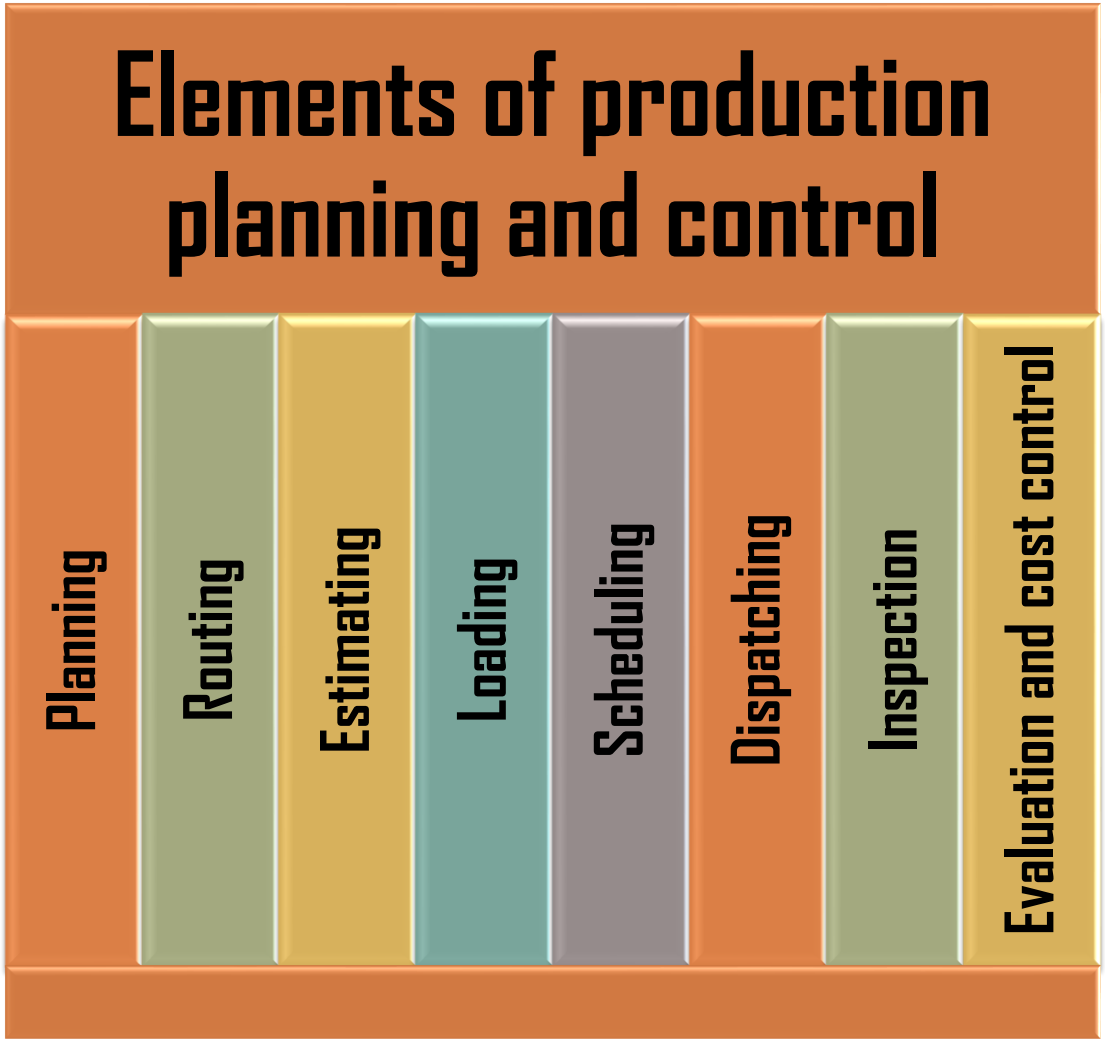
Production planning helps to give a regular supply of goods and services to the consumers at far prices. It results in consumer satisfaction.

12. Reduces the production costs

Production planning makes optimum utilization of resources, and it minimizes wastage. It also maintains optimum size of inventories. All this reduces the production costs.

Procedure and elements of production planning and control

Production Planning and Control is **a strategy to plan a chain of operations that supports manufacturers to be at the right place, at the right time.** It helps them achieve the most efficiency from their resources. It also includes activities of other departments such as sales, marketing, and procurement.



Procedure and elements of production planning and control

1. **Planning determines what will be produced, by whom, and how. It formulates the plan for labor, equipment, work centers, and material requirements needed for production.**

This is the first and the most important element of production planning and control. Planning refers to deciding in advance what is to be done in future. A separate planning department is established in the organization which is responsible for the preparation of policies and plans with regard to production to be undertaken in due course.

Procedure and elements of production planning and control

2. Routing determines the path raw materials flow within the factory. Using the sequence, raw materials are transformed into finished goods.

Coordinating every production process and scheduling every step is important to measure the production process duration. Routing shows the quantity and quality of materials and resources needed. It also shows the operations used and the place of production.

Routing manages the "How", "What", "How much", and "Where" of production. It systematizes the process and optimizes resources for the best results.

Procedure and elements of production planning and control

3. **Scheduling in simple words means fixation of time and date when each operation is to be commenced and completed. It is an important part of production control as all future process of production is based on it. Scheduling lays down ground work for all subsequent steps in production process.**

"The determination of the time that should be required to perform the entire series as routed, making allowance for all factors concerned."

Organizations use different types of schedules to manage the time element. These include Master Schedule, Operation Schedule, Daily Schedule, and more.

Procedure and elements of production planning and control

4. **Loading looks into the amount of work loaded against machines or workers. The total time to perform new work is added to the work already scheduled for the machine or workstation.**

If a machine or workstation has capacity available, more orders can make up the under load. If there is a capacity overload, proactive measures can prevent bottlenecks. Adding a shift, requesting overtime, bringing in operators from another shop, or using a sub-contractor are possible options.

Procedure and elements of production planning and control

5. **Dispatching is the release of orders and their instructions. It follows the routing and scheduling directions. This step ensures all items are in place for the employees to do their jobs.**

Here are the points that are part of "Dispatching":

- Issue materials that are important for production
- Issue orders or drawings for initiating the work
- Maintain the records from start to finish
- Start the control procedure
- Cascade the work from one process to another

Procedure and elements of production planning and control

6. This is the last but not the least component in the process of production planning and control. The function of inspection is primarily carried to ensure whether desired quality of products has been achieved or not. Inspection is carried out at different levels of production activity.

"Inspection is the art of comparing materials, product or performance with established standards."

Inspection of product at every stage viz., raw material, work in progress or semi finished goods and finished goods may be undertaken. Plant, machinery, equipment and tools used in production may also be inspected. For conducting inspection, specialized laboratories may be set up. The most important benefit derived from inspection is that it ensures pre-determined quality and minimizes wastage and rejected products.

Procedure and elements of production planning and control

7. **Evaluation and cost control** is a managerial effort to attain cost goals within a particular environment. Cost control is not a specific program. Rather, it is a routine activity carried out continuously. Cost must be controlled; otherwise, there will be wastage and misappropriation. Cost control is an important activity for any efficient organization since it has a major impact on the profitability of the organization.

The important variable cost components for production cost are as follows.

Raw material

Fuel and energy

Power cost

Maintenance cost

Utility cost

Manpower costs

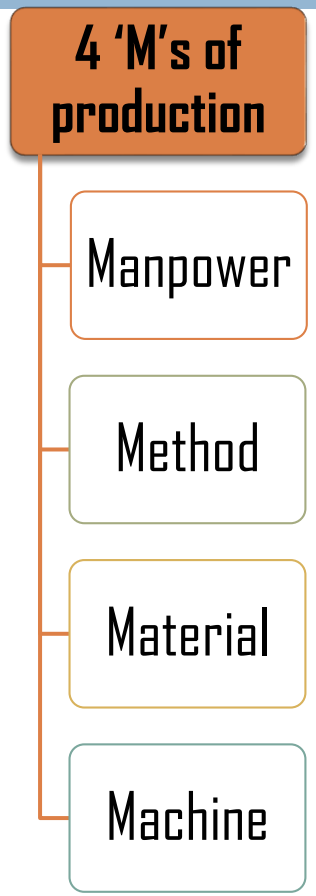
Inspection cost

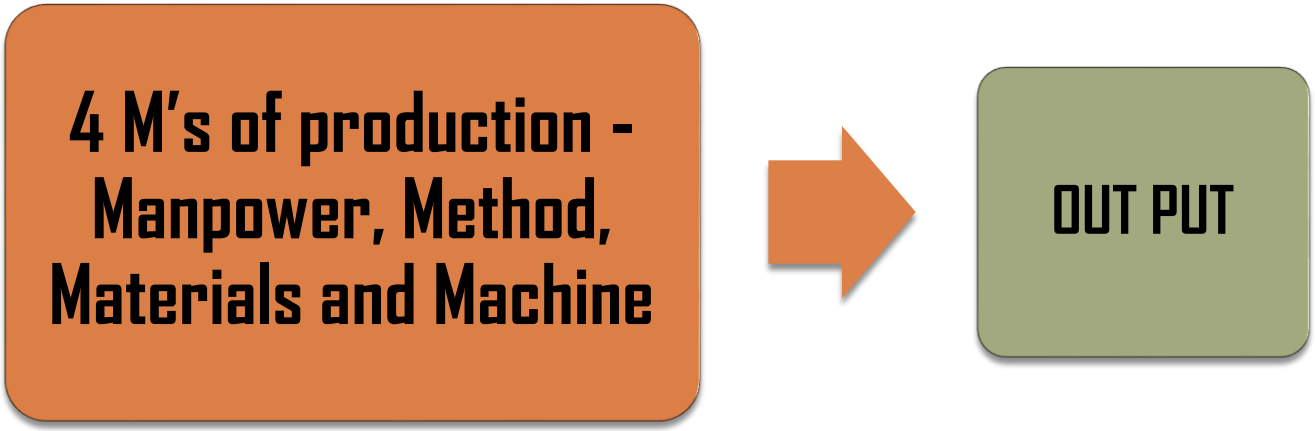
Procedure and elements of production planning and control

8. **Estimating is a** Setting up operation times to establish the performance standards of workers as well as machines. Further, it involves deciding the product quantity which should be produced and the total cost involved, as per the sales forecast.

Elements of production planning and control (4 'M's of production)

The most serious issues in the whole production system are the inputs and the transformation process. Their quality determines the quality of the output. The factors involved in the input and the production process are usually referred to as the 4 M's of production, namely Manpower, Method, Materials and Machine.





4 Ms of Production

Manpower

•Simply refers to the human workforce involved in the manufacture of products.
•It is considered as the most critical and important factor of production.

Method

•Refers to the process or technique of converting raw materials to finished goods.
•The raw material undergoes several stages before it is completed and becomes ready for delivery to the target consumers.

Machine

• Refers to the manufacturing equipment used in the production of goods or delivery of services.
•In the process of selecting the type of equipment to purchase, the entrepreneur may consider the following important elements:
1. Types of product to be produced
2. Production system to be adopted
3. Cost of the equipment
4. Capacity of the equipment
5. Availability of spare parts in the local market
6. Efficiency of the equipment
7. The skills required in running the equipment

Material

•Simply refers to the raw materials needed in the production of a product. Materials basically form part of the finished product. The entrepreneur may consider the following important factors in the selection of raw materials:
1. Cost
2. Quality
3. Availability
4. Credibility of suppliers
5. Waste that the raw material may produce

Production Planning and Control (PPC)

Planning and control are an essential ingredient for success of an operation unit. **The benefits of production planning and control are as follows:**

- It ensures that optimum utilization of production capacity is achieved, by proper scheduling of the machine items which reduces the idle time as well as over use.
- It ensures that inventory level are maintained at optimum levels at all time, i.e. there is no over-stocking or under-stocking.
- It also ensures that production time is kept at optimum level and thereby increasing the turnover time.
- Since it overlooks all aspects of production, quality of final product is always maintained.

QUESTIONS.....

Which of the following functions of Production Planning and Control is related to the timetable of activities?

a) Scheduling
b) Dispatching
c) Expediting
d) Routing

Answer: a

Which of the following processes is not a part of the Production Planning and Control system?

a) Integration of processes
b) Routing
c) Expediting and follow up
d) All of the above

Answer: a

The objectives of Production Planning and Control are _____.

a) Timely delivery of goods and services
b) Improving customer satisfaction
c) Coordinating with multiple departments to ensure that the production process is on track
d) All of the above

Answer: d

The correct sequence of operations in the Production Planning and Control process is _____.

a) Routing – Scheduling – Follow up – Dispatching
b) Scheduling – Follow up – Dispatching – Routing
c) Routing – Scheduling – Dispatching – Follow up
d) Dispatching – Routing – Scheduling – Follow up

Answer: c

Production Planning and Control function is crucial for ensuring cost savings and efficiency in _____.

a) Planning
b) Production
c) Promotion
d) None of the above

Answer: b

The control activity in Production Planning and Control is performed _____ of the plan.

a) Before execution
b) After execution
c) During execution
d) None of the above

Answer: b

_____ involves anticipating bottlenecks in advance and identifying steps that will ensure a smooth flow of production.

a) Production planning
b) Production control
c) Production audit
d) None of the above

Answer: a

Regulating the production process to ensure an orderly flow of materials is the objective of _____.

a) Production planning
b) Production control
c) Production audit
d) None of the above

Answer: b

Production planning is essential for _____.

a) Inventory management
b) Quality management
c) Supply management
d) All of the above

Answer: d

Production control within a company depends on _____.

a) Nature of production activities within the organization
b) Nature of the organization
c) Size of the organization
d) All of the above

Answer: d

_____ is responsible for the order of processing each activity under Production Planning and Control.

a) Loading
b) Sequencing
c) Routing
d) Scheduling

Answer: b

_____ is concerned with the time required to perform each activity under the Production Planning and Control process.

a) Loading
b) Sequencing
c) Routing
d) Scheduling

Answer: d

Material Requirement Planning (MRP) is a computerized system to plan the requirements for _____.

a) Finished goods
b) Raw materials
c) Work in progress
d) All of the above

Answer: d

The process of Production Planning and Control starts with _____.

a) Expediting
b) Scheduling
c) Estimating
d) Routing

Answer: c

The machines used for mass production are _____.

a) Special purpose
b) General-purpose
c) Manually operated
d) Semi-automatic

Answer: d

Unit -3

Quality Control

Quality- Definition, importance; Quality control, 7 tools of Quality control; Quality Assurance; Quality Standards; Inspection- Definition, inspection-loop, raw material inspection, in-process inspection, final inspection, comparability checks; 4-points system; Care labeling of apparel and textiles- American care labeling system.

QUALITY CONTROL

QUALITY: -

This is expressed by the I.S.O. definition. The totality of features and characteristics of a product or services that bears on its ability to stated &implied needs.

In simpler words one can say that a product has goods quality when it complies with the requirement specify by the client. Quality is fitness for the purpose.

QUALITY CONTROL: -

Quality control is a procedure or set of procedures intended to ensure that manufactured product or services adhere to define set of quality criteria or meets the requirement of the client or customer, quality control is similar to but not identical with quality assurance.

Importance of quality control

INCREASES QUALITY CONSCIOUSNESS: -

The most important advantage derived by introducing quality control is that it develops and increases quality consciousness among the workers in the factory which is greatly helpful in achieving desired level of quality in the product.

SATISFACTION OF CONSUMER: -

Consumers are greatly benefited as they get better quality products on account of quality control. It gives them satisfaction.

REDUCTION IN PRODUCTION COST: -

By marketing, effective inspection and control over production process and operation production costs are considerably reduced. Quality control further checks the costs of production considerably.

MOST EFFECTIVE UTILIZATION OF RESOURCES: -

Quality control ensures maximum utilization of available resources thereby minimizing wastage and inefficiency of every kind.

Importance of quality control

REDUCTION IN INSPECTION COSTS: -

Quality control brings about economies in inspection and considerably reduces cost of inspection.

INCREASED GOOD WILL: -

Producing better quality products and satisfying customers' needs, quality control raises the good will of the concern in the minds of people. A reputed concern can easily raise finances from the market.

HIGHER MORALE OF EMPLOYEES: -

An effective system of quality control is greatly helpful in increasing the morals of employees, and they full that they are working in the concern producing better and higher quality products.

IMPROVED EMPLOYER-EMPLOYEE RELATIONS: -

Quality control develops to better industrial atmosphere by increasing morale of employee which insures cordial employer-employee relation leading to better understanding and closeness between them.

Importance of quality control

IMPROVED TECHNIQUES AND METHODS OF PRODUCTION: -

By supplying technical and engineering data for the product and manufacturing processes, improved methods and designs of production are insured by quality control.

EFFECTIVE ADVERTISEMENT: -

Organization producing quality products have effective advertisements. They win the public confidence by supplying those better quality products.

FACILITATES PRICE FIXATION: -

By introducing quality control measures, uniform products of some quality are produced, this greatly facilitates the problem of price fixation, and one price of standard products becomes prevalent in the market.

INCREASED SALES: -

Quality control ensures production of quality products which is immensely helpful in attracting more customers for the product there by increasing sales. It is greatly helpful in maintaining existing demand and creating new demand for the product .It has been rightly pointed out that quality control is a powerful instrument with the help of which markets both at home and abroad can be expanded.

TOOLS OF QUALITY CONTROLS

The 7 QC tools are:

1. Check sheet
2. Fishbone diagram (cause and effect diagram, or Ishikawa diagram)
3. Histogram
4. Pareto chart
5. Control chart
6. Scatter diagram
7. Stratification

The 7 QC tools are:

CHECK SHEET: The check sheet is a simple document that is used for collecting data in real time and at the location where data is generated.

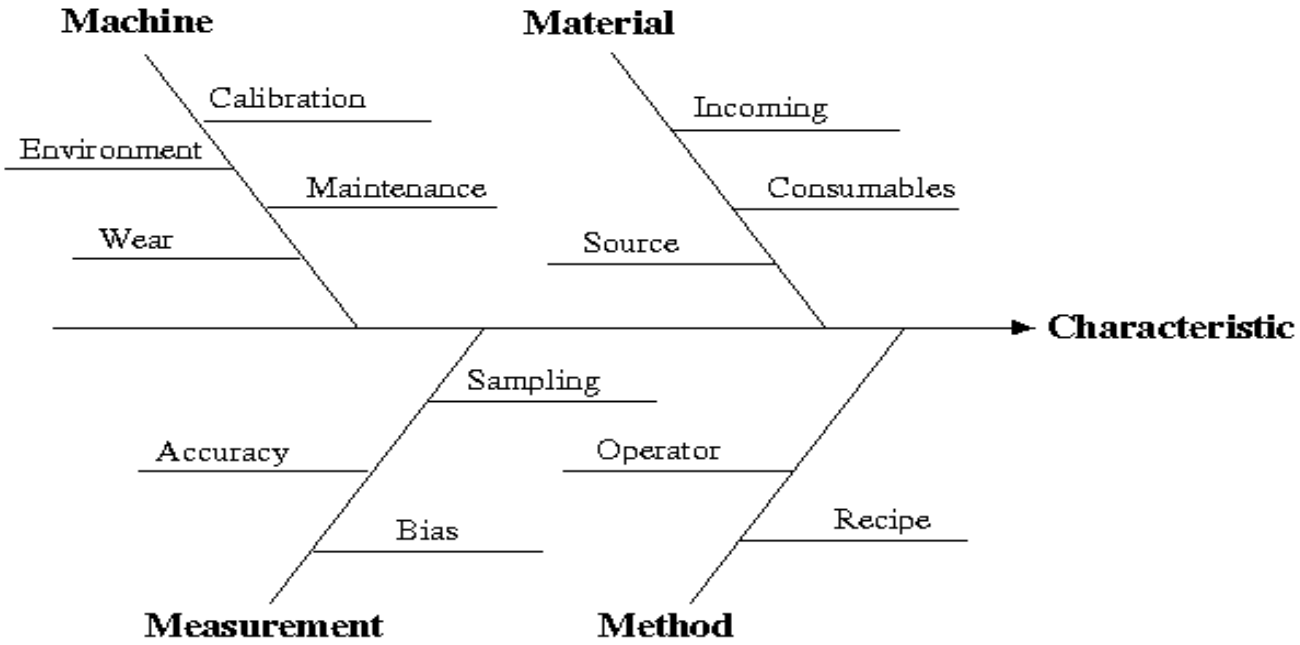
The document is typically blank from that is designed for the quick, easy and efficient recording of the desired information which can be either quantitative and qualitative.

Arun Bakery

Complaint type	Tally	Total
Packaging	𝍸 𝍸	8
Quality	𝍸 𝍸 𝍸	13
Foreign material	1111	4
Infestation	111	3
Others	11	2

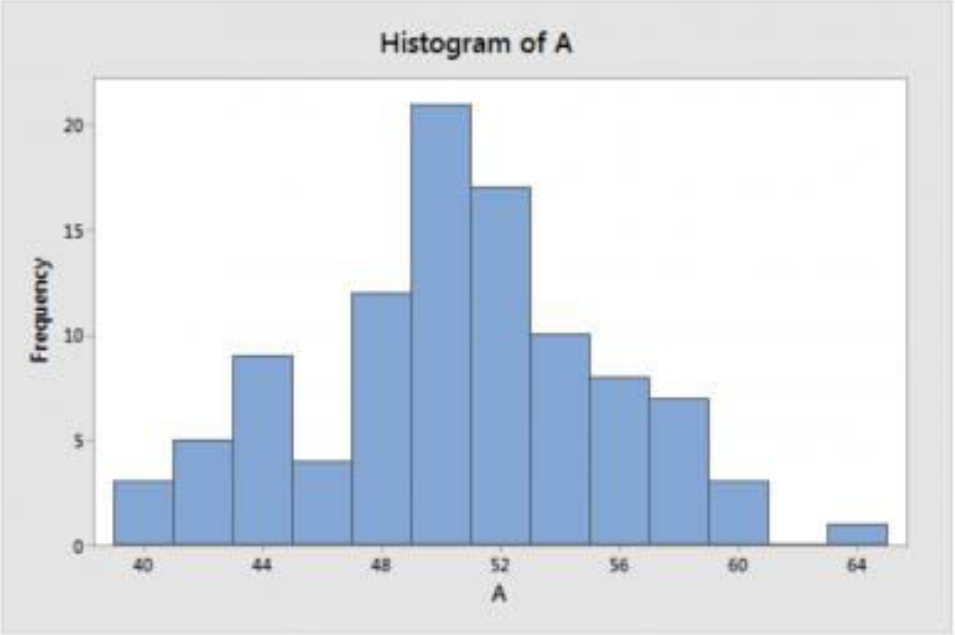
The 7 QC tools are:

Fishbone diagram: Fishbone diagrams are used to drill down to find the root cause of a problem. As the name implies, the diagram looks like the bones of a fish, where each main bone represents a specific category of possible root cause, and the subsequent drilling down is shown as smaller and smaller bones.



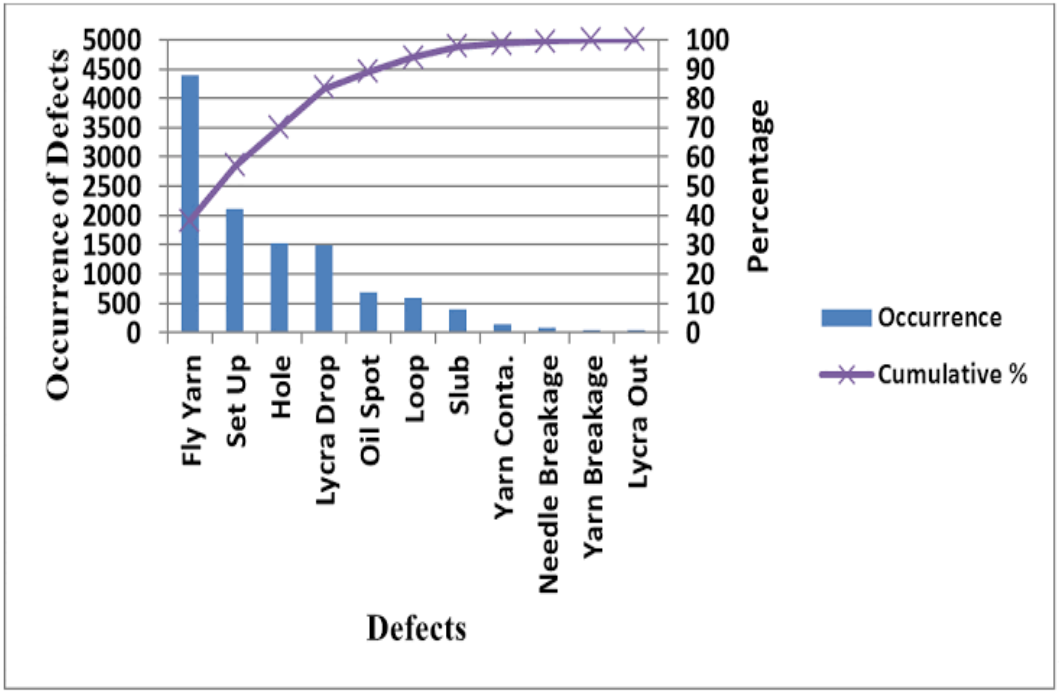
The 7 QC tools are:

Histogram: This is a bar graph showing the frequency of a set of data, usually continuous data. The histogram allows you to see the center of the data, the range of the data, and the distribution of the data. It is a very useful snapshot. The downside is that you can't see the sequence or order of the data.



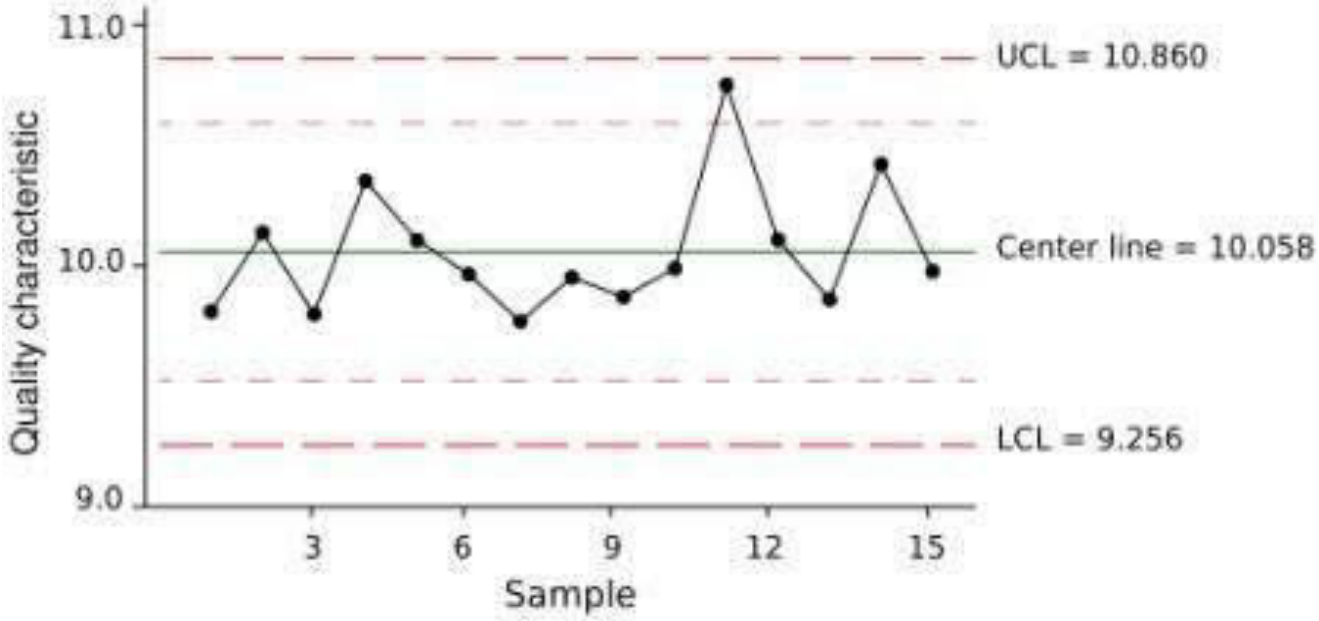
The 7 QC tools are:

Pareto chart: This chart is based on the 80/20 principle that says 80% of your effect is caused by 20% of your causes. For example, 80% of your sales comes from 20% of your customers. **Dr. Joseph Juran,** who developed this chart, often referred to this principle as the *vital few and trivial many*. He later revised that to the *vital few and useful many*. The Pareto chart lists the causes in descending order of frequency or magnitude. It is used to prioritize what you should look at first to improve your process.



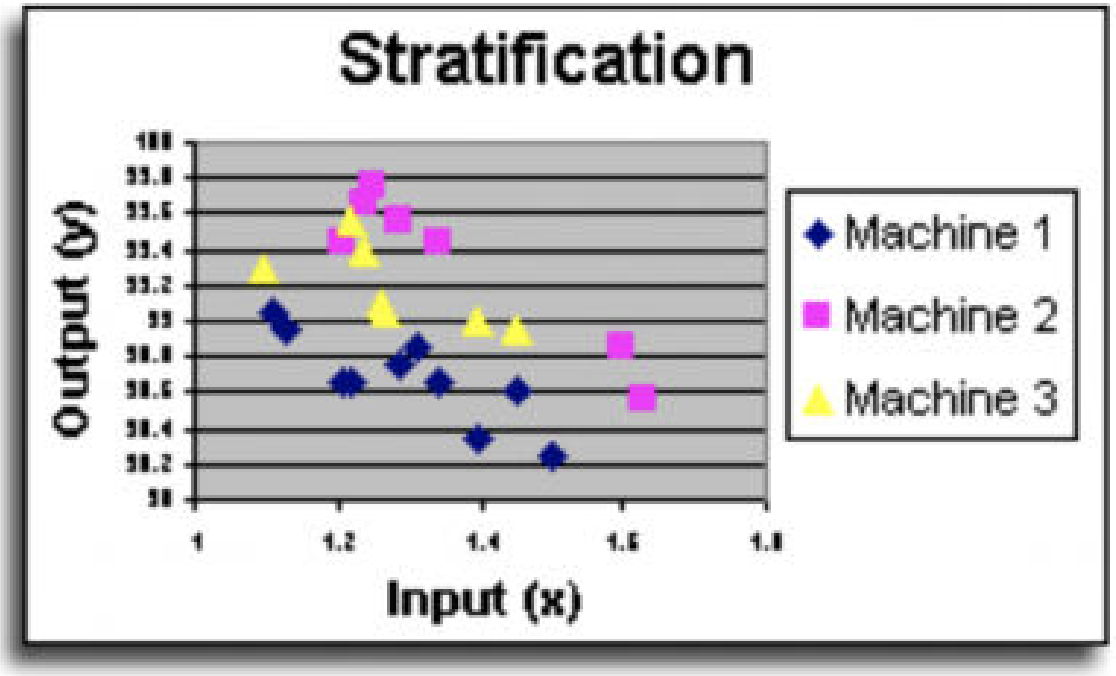
The 7 QC tools are:

Control chart: A control chart is a statistical tool that looks at your process data over time for the purpose of distinguishing between special cause and common cause variation.



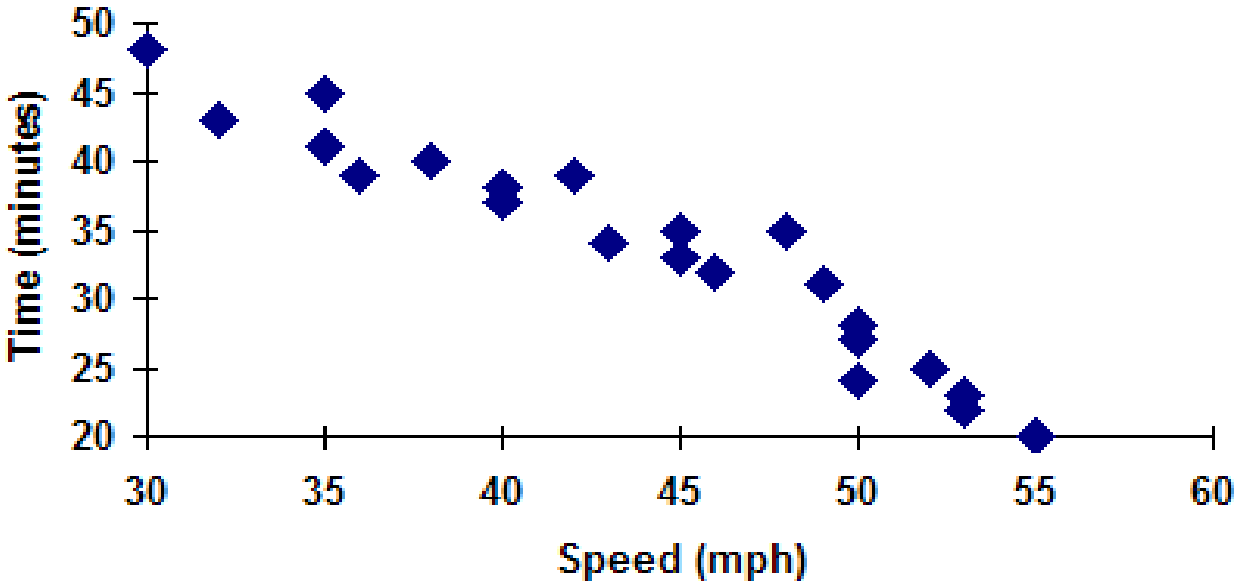
The 7 QC tools are:

Stratification: This is a graph that shows data that has been stratified when the data comes from different sources. It is useful to view the data by certain strata such as shift, gender, geographic location, machines, or suppliers.



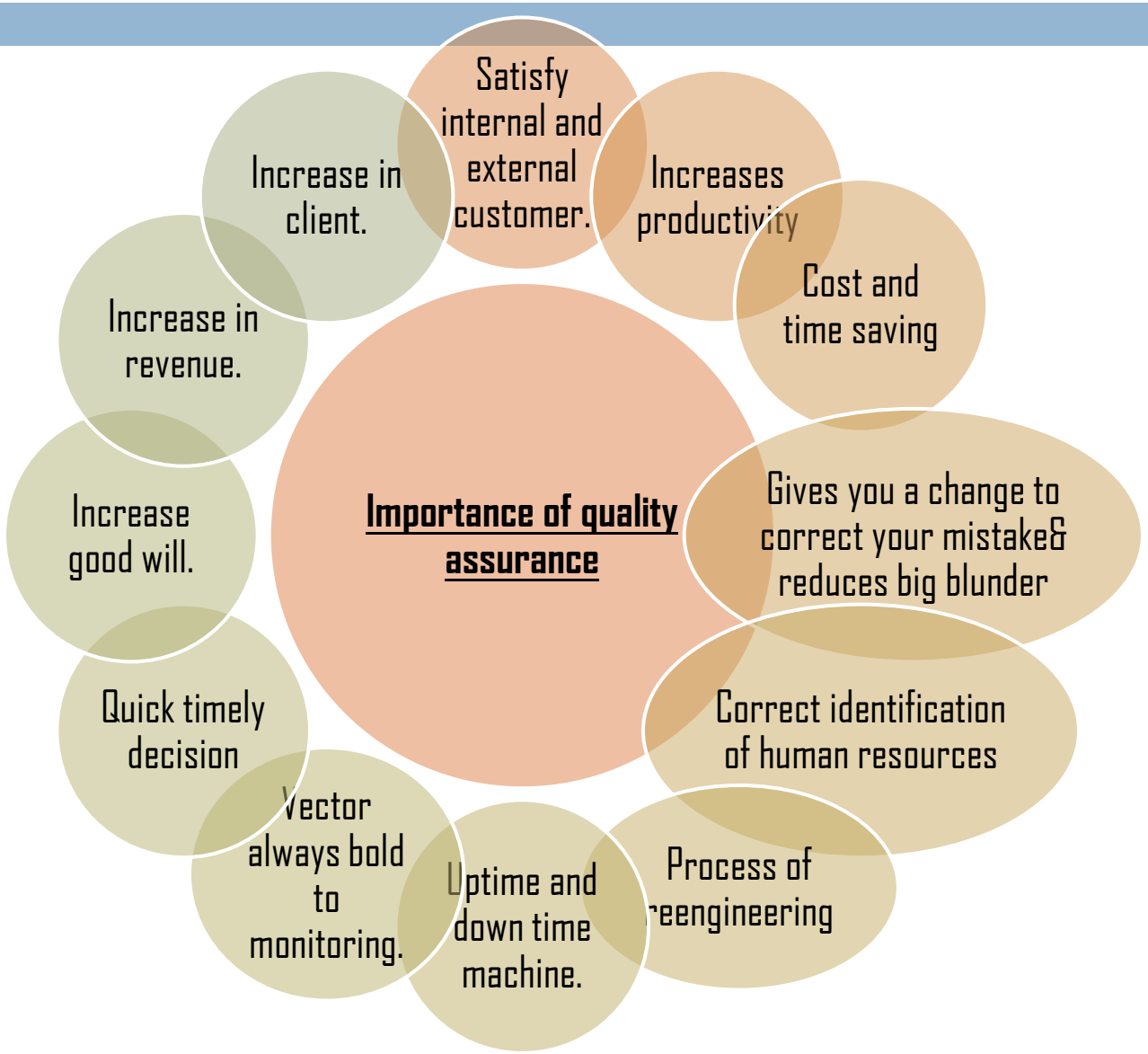
The 7 QC tools are:

Scatter diagram: These are also known as scatter plots. They're used to show a graphical correlation between a set of paired data on an X and Y axis. It is the graphical representation of what you would use for regression analysis.



QUALITY ASSURANCE

A part of quality management focused on providing confidence that quality requirement will be fulfilled.



QUALITY STANDARDS

Quality standard:-

Quality standard provides the mathematical and statistical procedures in the evaluation of experiment and test methods.

This procedure encompass the information gathering stage of an experiment where variation is present and includes the probability sampling process, the determination of the precision and buyers of an experiment of the measurement of the reliability and degree of uncertainly of test results and data.

These quality control standards help guide laboratories and their respective scientists and engineering in the careful planning and test procedures.

Quality standard:-

Quality standards are a set of standards that have been chosen and implemented by business all-round the word to show commitment to deliver quality product and services to customers.

AATCC: - American association of textile chemist and colorist.

ASTM: - American society of testing and materials.

ANSI: - American national standard institute.

BSM: - British standard institute.

ISO: - International organization for standardization.

BIS: - Bureau of Indian standards.

Thus quality standard is a document that has been prepared approved and published by a recognized standard organization and contain requirement or procedures for and orderly approach to a specific activity. It may include product design requirement test methods, classification recommended practices and others consideration.

These standards can be: -

1) company standards
2) industry standards
3) government standards
4) worldwide standards

Quality standard:-

Importance of standards

It defines safety requirement indented to reduce the risk of accident.

It sets a level of performance for products.

They are the frame work for quality process.

It reduces cost and save money.

It avoids repetitions of past mistakes.

It facilities communications and prevents miss understandings.

They provide continuity.

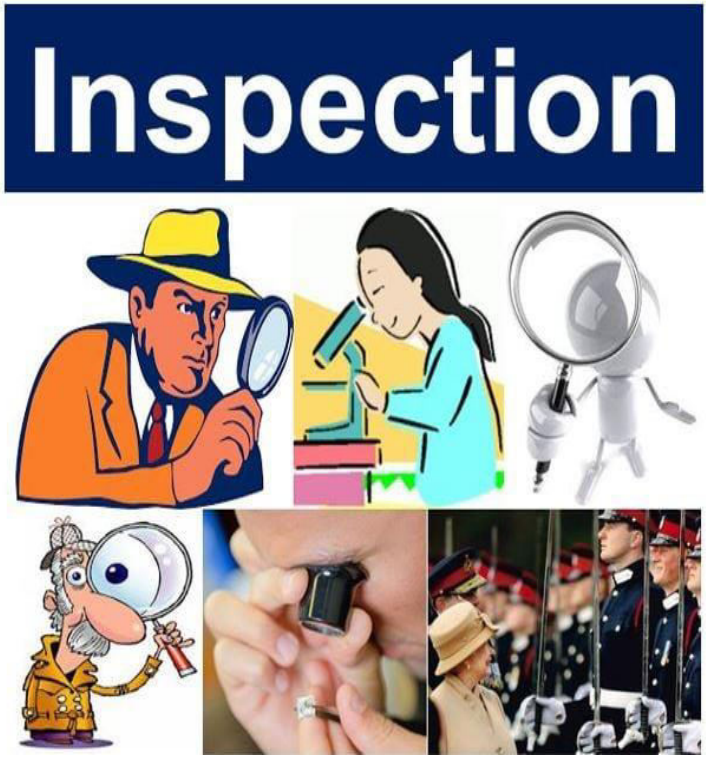
The standard is used in fabric testing and others raw material or accessories testing.

For e.g.

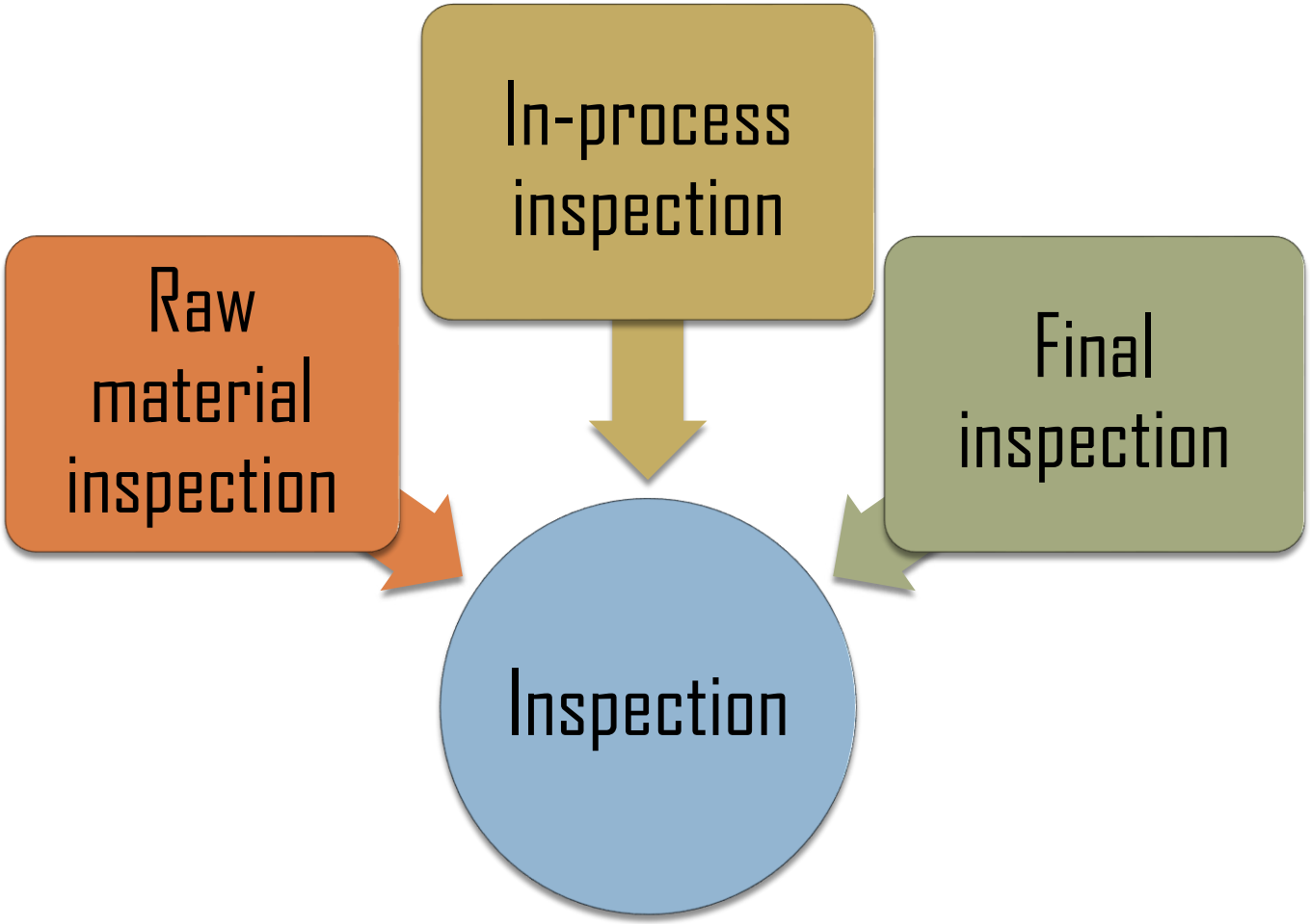
1. Fabric width standard test – ASTMD 37
2. Drape standard test – BS 5058 1973
3. Abrasion test –ASTMD 3885 - 1999
4. Moisture content of fabric-ISO 6741 – 1989

INSPECTION

An inspection involves checking something, i.e., examining and assessing something. We may inspect a building or organization to make sure that it meets specific standards. The inspectors need to ensure that nothing is faulty and that nobody is breaking any laws.

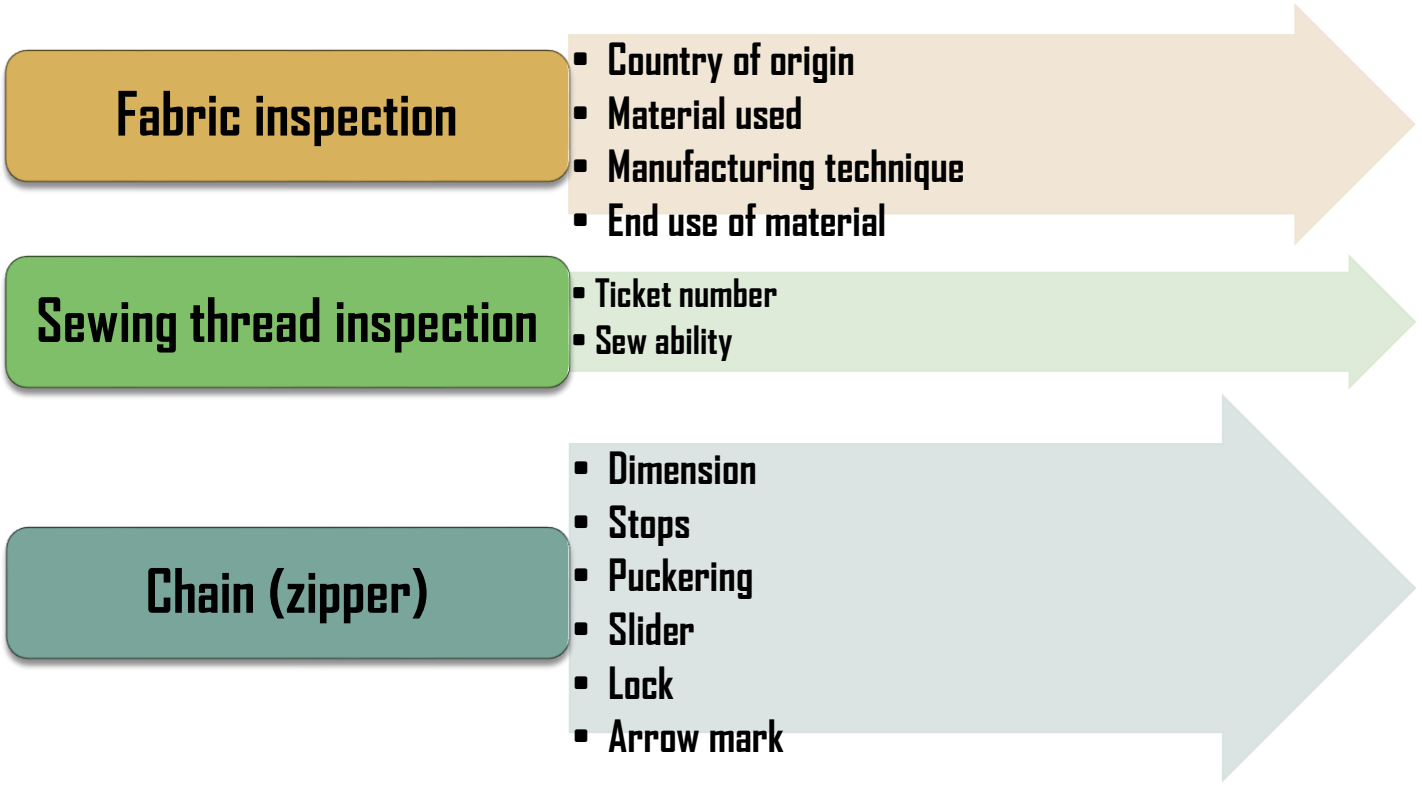


Stages of Inspection



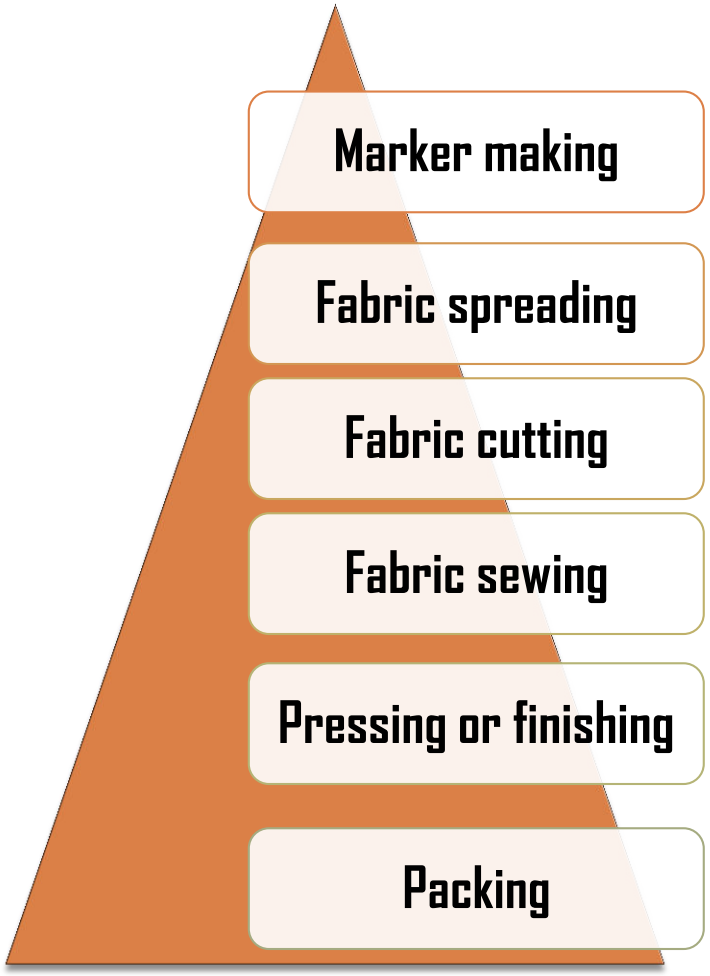
Raw Material Inspection

In garments industry, raw material means mainly the fabrics, but sewing thread, zipper or chain, interlining etc. also may be considered under the items of raw material.



In-Process Inspection

The process of inspection of the various parts of a garment before joining is called in-process inspection. In garments industry, inspection is done in each section starting from spreading to finishing. The main objective of in-process inspection is to identify the defects in the primary stages of various sections and to adopt the necessary steps to rectify the defects. Because, the defects detected as earlier, its rectification cost will be lesser. In order to control the quality of garments, the measures that can be adopted in the steps of garments making, are discussed below in steps:



Final Inspection

In the final inspection, mainly the whole inspection of garments is done, because, before this stage, there is no opportunity to do inspection of a complete garment. This final inspection is very much important from the buyers end. In this final inspection, mainly the size of the garments, form fitting, and the defects of the garments are inspected.

4-points system

The 4-Point System assigns 1, 2, 3 and 4 penalty points according to the size, quality, and significance of the defect. No more than 4 penalty points is assigned for any single flaw. A defect can be measured either length or width direction; the system remains the same. Only major errors are considered.

No penalty points are assigned to minor defects. Whenever errors are recognized during fabric inspection under 4 points system and defect must be assigned a number of points depending on the severity or length.

Size of Defect	Penalty Points
Length of defects in fabric (either length or width)	
Defects up to 3 inches	1
Defects > 3 inches ≤ 6 inches	2
Defects > 6 inches ≤ 9 inches	3
Defects > 9 inches	4
Holes and openings(largest dimension)	
1 inch or less	2
Over 1 inch	4

Understanding the Fabric Inspection Preparation and Inspection Methodology (sample selection, handling, inspection, sorting, etc...)

1. Fabric inspection is done in suitable and safe environment with enough ventilation and proper lighting.
2. Fabric passing through the frame must be between 45-60 degree angles to inspector and must be done on appropriate Cool White light 2 F96 fluorescent bulbs above viewing area. Back light can be used as and when needed.
3. Fabric speed on inspection machine must not be more than 15 yards per minute.
4. Standard approved bulk dye lot standards for all approved lots must be available prior to inspection (if possible)
5. Approved standard of bulk dye lot must be available before starting inspection for assessing color, construction, finish and visual appearance.
6. Shade continuity within a roll by checking shade variation between center and selvage and the beginning, middle and end of each roll must be evaluated and documented.
7. Textiles like knits must be evaluated for weight against standard approved weight.
8. Fabric width must be checked from selvage to selvage against standard.
9. All defects must be flagged during inspection
10. The length of each roll inspected must be compared to length as mentioned on supplier ticketed tag and any deviation must be documented and reported to mill for additional replacement to avoid shortage.
11. If yarn dyed or printed fabrics are being inspected the repeat measurement must be done from beginning, middle and end of selected rolls.

Care labeling of apparel and textiles- American care labeling system

According to the Federal Trade Commission's Care Label rule, care labels may be composed of either words or symbols. Irrespective of whether the content is words, symbols, or both, care instructions appear in the following order:

1. Machine wash / Hand wash / Dry-clean
2. Washing temperature (hot / warm / cold)
3. Washing machine programme (delicate / permanent press / normal cycle)
4. Bleaching instruction (do not bleach / non-chlorine bleach / chlorine bleach)
5. Drying method (tumble dry / line dry / flat dry / drip dry)
6. Ironing (do not iron / cool iron / warm iron / hot iron)
7. Warnings

Symbols used in the American Care Labelling System (ASTM Symbols)

Washing

Do not wash

Machine wash cycles

Normal

Permanent press

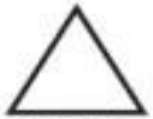
Delicate / gentle

Hand wash

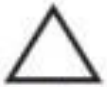
Water temperatures (Maximum)

(200°F)	(160°F)	(140°F)	(120°F)	(105°F)	(65°F - 85°F)
95°C	70°C	60°C	50°C	40°C	30°C
Symbol (s)					

Do not wring



Bleaching



Bleaching

Any bleach when needed

Only non-chlorine bleach when needed

Drying

Do not tumble dry

Do not dry (used with do not wash)

Tumble dry cycles

Normal

Permanent press

Delicate / gentle

Line dry / hang to dry

Dry flat

Tumble dry heat setting

Any heat

High

Medium

Low

No heat / air

Drip dry

In the shade (added to line dry, drip dry, or dry flat)

Ironing

Do not iron

Iron-dry or steam

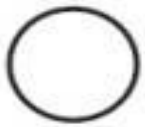
Maximum temperature

200°C (390°F) High

150°C (300°F) Medium

110°C (230°F) Low

No steam (added to iron)



Dry-clean

Do not dry-clean

Dry-clean - normal cycle

A — Any solvent

P — Any solvent except trichloroethylene

F — Petroleum solvent only

Dry-clean - additional instructions

Short cycle

Reduce moisture

Low hast

No steam finishing

QUESTIONS.....

Unit -4

Inspection & Audits

Final inspection/Audit; Acceptance Quality level (2.5) and comparison of different levels; importance of compliance in garment industry; Introduction to Third Party Audit Organization in India- SGS/Beaureau Veritas/Intertek

Acceptance Quality level (2.5)

The term AQL stands for acceptable quality level or acceptance quality level.

It is one of the most used terms in the readymade garments industry when it comes into consideration to quality. It should be noted here that, most of the acceptance decisions of garment export order shipments are made based on AQL based sampling plans. To ensure the right quality products, an AQL chart has to follow during an inspection of apparel which varies from product to product, process to process, and even buyer to buyer. Acceptable Quality Level (AQL) has great importance in the ready-made apparel business.

Acceptable Quality Level (AQL) refers to the maximum number of defective items that could be considered acceptable during the random sampling of and **inspection**. It is expressed in a percentage (%) number of average defective items where the average **defective** item is the multiple results of the total number of defective items found during the inspection and the total number of items inspected.

The faults or defects which are found during the inspection are mainly classified into four categories:
Critical: Must be 100% accurate. There is no range.
Major: Normally 2.5%
Minor: Normally 4%
Slight: Normally 6.5%

Types of AQL System Followed in Apparel Industry:
There are a total of six types of AQL system followed in the **garment manufacturing** industry which are pointed out below:
AQL-1.0%,
AQL-1.5%,
AQL-2.5%,
AQL-4.0%,
AQL-6.5%,
AQL-10%.

AQL Chart for Garment Industry:

An acceptable quality level (AQL) chart has been presented below to facilitate the easy understanding of the above discussion.

Lot or Batch Size	Sample Size Code Letter	Sample Size	Acceptable Quality Level (AQL)					
			2.5%		4.0%		6.5%	
			Ac	Re	Ac	Re	Ac	Re
2-8	A	2	0	1	0	1	0	1
9-15	B	3	0	1	0	1	0	1
16-25	C	5	0	1	0	1	0	1
26-50	D	8	0	1	1	2	1	2
51-90	E	13	1	2	1	2	2	3
91-150	F	20	1	2	2	3	3	4
151-280	G	32	2	3	3	4	5	6
281-500	H	50	3	4	5	6	7	8
501-1200	J	80	5	6	7	8	10	11
1201-3200	K	125	7	8	10	11	14	15
3201-10000	L	200	10	11	14	15	21	22
10001-35000	M	315	14	15	21	22	21	22
350001-150000	N	500	16	18	23	25	23	25
150001-500000	O	800	18	20	25	28	25	27
500000 and over	P	1250	20	22	28	30	28	30

Compliance

Compliance means conformity to certain standards. Every management of the textile and garment industry should maintain excellent working conditions for its employees and workers. Although the entire well-established project tries to maintain well compliance there are some lacking proper compliance issues.

COMPLIANCE IN GARMENT INDUSTRY; here is a list of compliance in which some points are maintained fully and some are partial. The following points are specially for the garment industry.

- Compensation for holiday
- Leave with wages
- Health register
- Time care
- Accident register
- Workman register
- Equal remuneration
- Nation festival holiday
- Buyers code of conduct
- Health and safety committee
- Canteen
- Overtime register
- Labor welfare
- Weekly holiday fund
- Sexual harassment policy
- Child labor abolition policy
- Zero abasement policy
- Working hour policy
- Hiring/recruitment policy
- Environment policy
- Security policy

Importance Of Social Compliance In Garment Industry

Customer focus; organizations depends on their customer and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.

Leadership ; leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objects.

Involvement of people; people at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

Process approach; a desired result is achieved more efficient when activities and related resources are managed as a process.

Continual improvement; Continual improvement of the organization's overall performance should be a permanent objective of the organization.

Introduction to Third Party Audit Organization in India

Third party audits are independent impartial audits with the objective to assess the level of conformity of a management system to certain audit criteria. The most common form of third-party audits is one that is conducted to assess the degree of conformity to International Standards (ISO).

These audits are also known as '**Certification Audits**' because once the conformity is confirmed the Certification Body that conducted the audit then issues the relevant **Certificate**.

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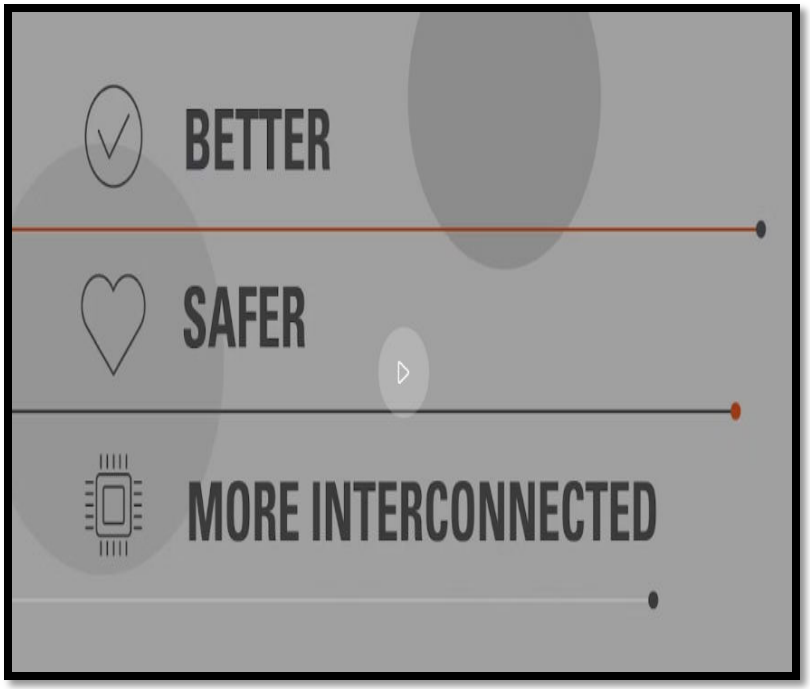
We are the world's leading testing, inspection and certification company.

We are recognized as the global benchmark for sustainability, quality and integrity. Our 98,000 employees operate a network of 2,650 offices and laboratories, working together to enable a better, safer and more interconnected world.

Wherever you are, whatever your industry, our experts worldwide provide specialized solutions to make your business faster, simpler and more efficient.



We offer stability, opportunities for growth and the chance to make a difference.

A career at SGS offers stability, secure employment, a friendly and supportive culture, and the opportunity to learn, grow and be part of our ambition to make a difference.

Be Proud As part of the world's leading testing, inspection and certification company, you'll share our stability and growth. Enjoy a truly rewarding career in a financially stable, global, multicultural, Swiss-based organization with a proud heritage that has been making the world a better, safer place for over 140 years.

Be Collaborative Collaborate in an open, friendly and supportive culture that thrives on teamwork. Flourish in an environment where people respect and help each other to grow and succeed.

Be the Difference Help build a better, safer and more interconnected world. Enjoy a fulfilling career with the opportunity to truly make a difference – to yourself, your career, your community and the world.

Be the Expert Expand and enrich your career through endless opportunities to learn, grow your expertise and fulfill your potential.

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We are a world leader in Testing, Inspection and Certification. We assist our clients throughout the lifetime of their assets, products and infrastructure, helping them assure quality, reduce costs, increase productivity and foster a more responsible, sustainable culture.

AMIT GHOSH
Senior Vice President,
CIF South Asia Region
Bureau Veritas

At Bureau Veritas, we offer our customers a portfolio of services that is impressive in its breadth and reach. All our employees take pride in serving our customers, and society-at-large, with the best professional service. Our customers reach out to Bureau Veritas to not only avail of our testing, inspection, and certification services, but also for our professional advice to minimize their risks and improve their performance.

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For more than 130 years, companies around the world have depended on Intertek to ensure the quality and safety of their products, processes, and systems.

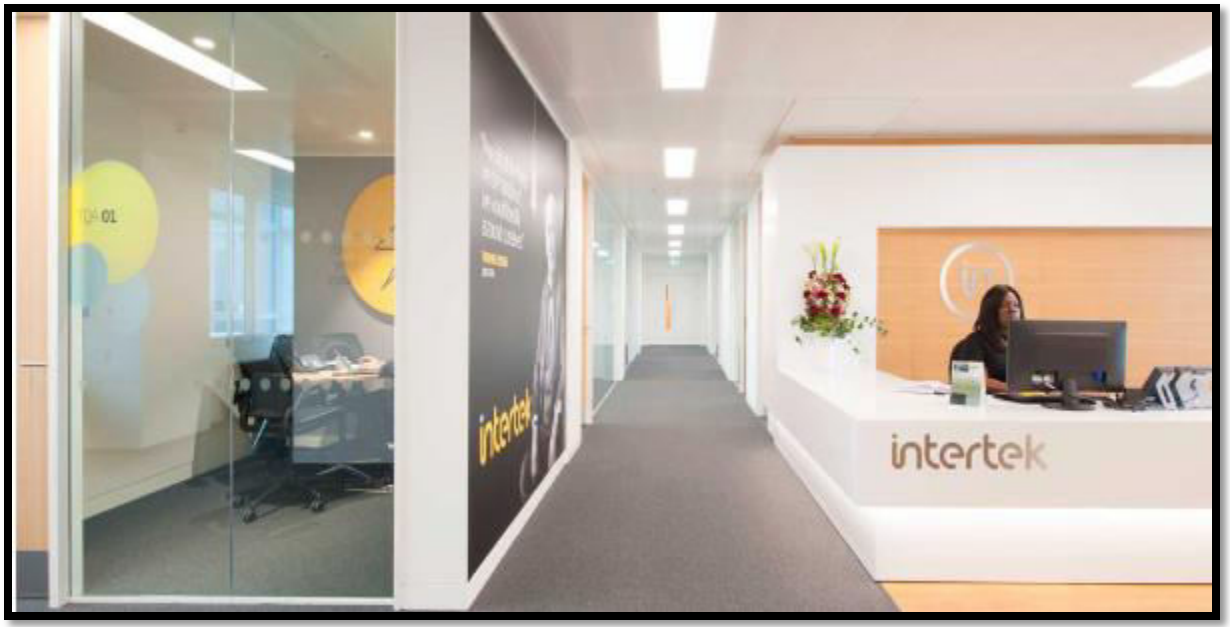
Through our global network of state-of-the-art facilities and industry-leading technical expertise, we provide innovative and bespoke Assurance, Testing, Inspection and Certification (ATIC) services to our customers, supporting their operations and supply chains.

With more than 2400 employees in 20 strategically located offices and labs across India, we provide responsive and local coverage, delivering our Total Quality Assurance customer promise. Our operations are supported by a vast global network of more than 44,000 employees in 1,000 locations in over 100 countries, making us the industry leaders in the ATIC industry.

Whether you are a manufacturer or retailer, a government body, or an industry specialist, you understand the need for safety and quality. The challenge of meeting ever changing regulatory requirements in each market creates continuous pressure to shorten production cycles whilst controlling costs and reducing product recall, thereby protecting your brand and its reputation.

At Intertek, we use our world-class expertise in quality and safety solutions to help validate your products, processes, and operations so you can be confident that your reputation is in safe hands. Using our extensive knowledge, experience, and skills we can guide and enable you to address your commercial challenges and gain a competitive edge in your markets. Our global reach and local presence in more than a hundred countries means that we can deliver bespoke solutions to you wherever you do business.

We partner with our customers across their supply chains, assisting them to fulfill the end-user's expectations of safety, sustainability, performance, integrity, and desirability, in virtually any market worldwide. We do this with the provision of inspection, testing, analytical testing, technical inspection and staffing services, asset integrity management, management system certification and other customized solutions to all industry sectors.



QUESTIONS.....

Unit -5

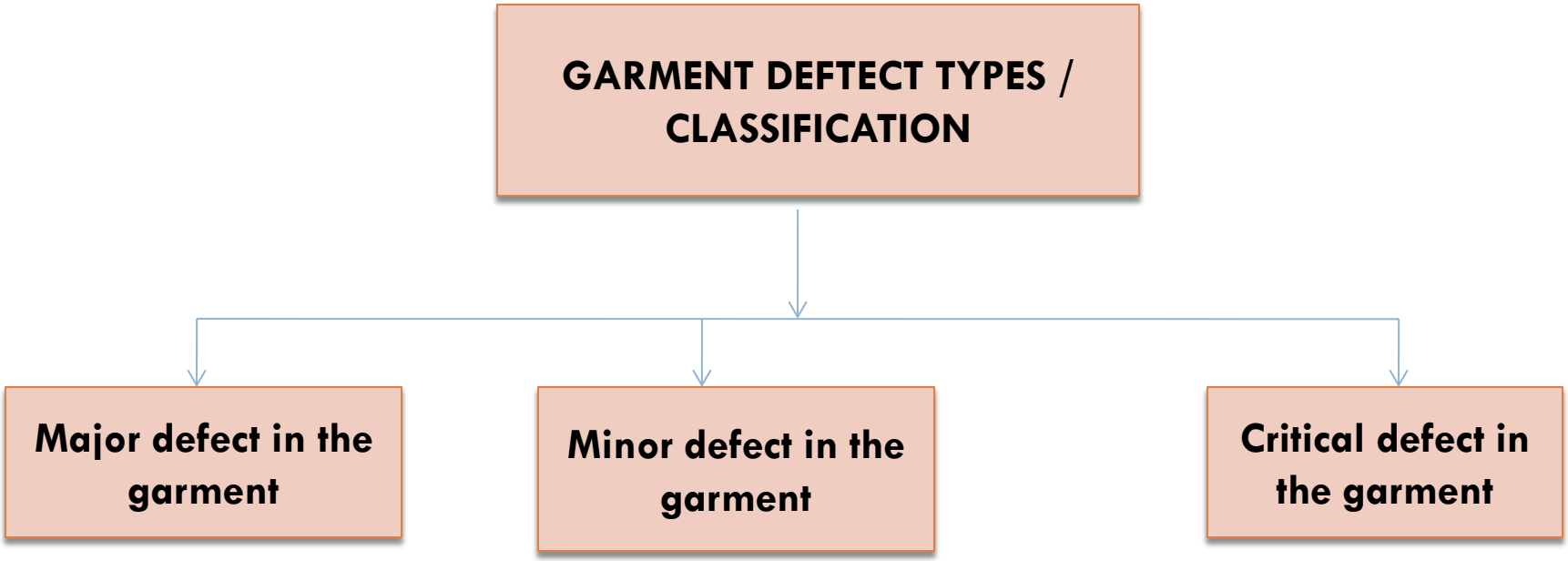
Defect Classification

Critical, Major and Minor defects in Garments, Introduction to terms- Tolerance Limits, Rejected and Surplus, Relation of defects percentage and cost of quality.

Major, Minor, and Critical Defects in Garments Industry

A defect is a kind of flaw. To maintain a good quality level, we need to know about defects produced in the garments industry. A common and popular word in the garments industry is a defect. Rejecting the item is another term for garment faults. The garments industry is prone to a variety of flaws because of criticality in the sewing process. These flaws in garment manufacturing depend on how they are categorized and how well an inspector can make judgment calls. It is unrealistic to compile a list of every possible flaw that could be found during a quality inspection. Despite this, the tables that follow do include information on the bulk of flaws.

Here I am present on 3 defect categories and the defect list; Major, Minor, and Critical Defects in the Garments Industry.



Major defect

- A major defect is a defect that affects the Aesthetics of the final product, the durability of the product. Due to this the garment is complained about and returned. That is, there are defects in the clothes that are noticeable. Due to this, if there is a major defect in any garment, it is returned by the customer. For example:- Some of the Major defects are Intermittent stitching, Large stitch gaps between stitches, and Problems like open seams are called major defects.

Major Defects in the Garments

- Skip stitch
- Broken stitch
- Raw stitch
- Open stitch
- Puckering
- Twisting
- Short stitch
- Uneven stitch
- Uneven join
- Print missing

- Bar tack missing
- Bar tack displace
- Oil spot
- Dirt spot
- Open seam

Minor defects

A minor defect is a defect that is not clearly visible to the eye. Not affecting the function, and aesthetics of the product. That is, if there is a minor defect in any garment, then there is no difficulty in buying the garment. Some examples of minor defects are explained. For example:- small uncut thread, uneven lob.

Minor Defects in the Garments

- Uncut thread
- Gathering or bunched stitching
- Insecure shoulder tape
- Dart not properly located
- Broken yarn
- Miss pick
- Needle mark

- Wavy stitch
- Dirt material that can easily be washed off
- Uneven stitch
- Dye lines and dirty marks not effected the appearance.

Critical defects

A critical defect is a bigger defect than the above two defects. It directly impacts product function. Generally, a critical defect renders the garments unusable. If a critical defect is found anywhere then it is better not to buy the garment. Because critical defects include various problems that render the garment unusable. Some examples of critical defects are:- Breaking something like metal and staying in clothes, No buttons in clothes, and Having problems with clothing care labels. These problems are classified as critical defects

Critical Defects in the Garments

- Broken needle in garment
- Wet garment
- Mold in garment
- Broken button
- Loose button (kids item)
- Button sharpness
- Style number mistake
- Country code mistake
- Season number mistake
- Print missing in garment
- Over moisture
- Style mistake

- Expired chemical use for dyeing
- Sharp edge
- Fabric flaws (slub, knot, missing, thick yarn)
- Rusting of buttons/ poorly attached (kids)
- Washing symbol on the care label missing
- The price information on the hangtag missing

Tolerance Limits

Tolerance in textiles is the amount of acceptable variation from the specified measurement from which you can cut out pattern pieces, add **components** or sew seams.

Tolerance is measured in + or - mm.

Seam allowance is the amount of material between the edge of the fabric and the seam, and it is tested to check it meets the tolerance stated in the **manufacturing specification**. In home sewing, seam allowance is generally 1.5 cm, whereas in industry, to save on fabrics, the seam allowance is often 1.0 cm. The **tolerance** is always minimal - otherwise the product won't fit together.

Some seams become bulky once sewn, eg points of collars, and they need to be trimmed so that once **turned** and pressed they will sit flat. Trimming of seam allowance is also necessary on curved seams.

Rejected and Surplus

- **Reject**

Factory seconds, also known as **factory rejects** or simply **seconds**, are retail items that, through minor fault of manufacture, are sold to the public for a reduced rate, rather than being discarded. The goods are often resold at this lower rate after failing the factory's quality inspection, being returned to the manufacturer's factory by the original retailer, or (less frequently) being returned to the retailer or wholesaler by the customer.

Rejects:

•A product becomes reject when it loses sales ability in the market.

•Single defect in most visible area of an apparel may make the whole garment a reject.

Types of defects:

•Non – sewing defects.

•Sewing defects.

Non – sewing defects:

•Defects due to faulty/sub-standard raw materials.

•Defects due to wrong pattern.

•Defects due to wrong spreading/cutting.

•Defects due to poor handling of goods.

•Defects due to oil marks.

•Defects due to wrong ironing/folding/packing.

Sewing defects:

•Proper appearance & performance of seam related with the following factors-

•Stitch

•Feed system

•Proper selection of needle & thread etc.

•During sewing the problems appear may be grouped as below—

•Problem of stitch formation.

•Seam pucker.

•Fabric damage along the seam line/stitch line.

What is surplus garment?

- Besides, leftover garments those remain in factory are called stock lot or surplus garments. Almost all factories sell their stocks garments at very cheap price compared to actual price.

Things You Must Know If You're Into Export Surplus Garments

Excess production: While manufacturing the garments, factories make sure to produce a tad bit more than the ordered quantity, 2.5%-5%, to cover for the defects during the manufacturing process. Post complete shipment of these garments, the leftover ones constitute surplus.

Quality issues: The buyers refrain from accepting garments that don't live up to their quality standards. Thus, the ones rejected during the close quality inspection process done by the buyers result in the stock lot.

Shipment rejection: Sometimes, a delay in shipment or inability to meet the size ratio or quality specification of the buyers leads to the rejection of those garments.

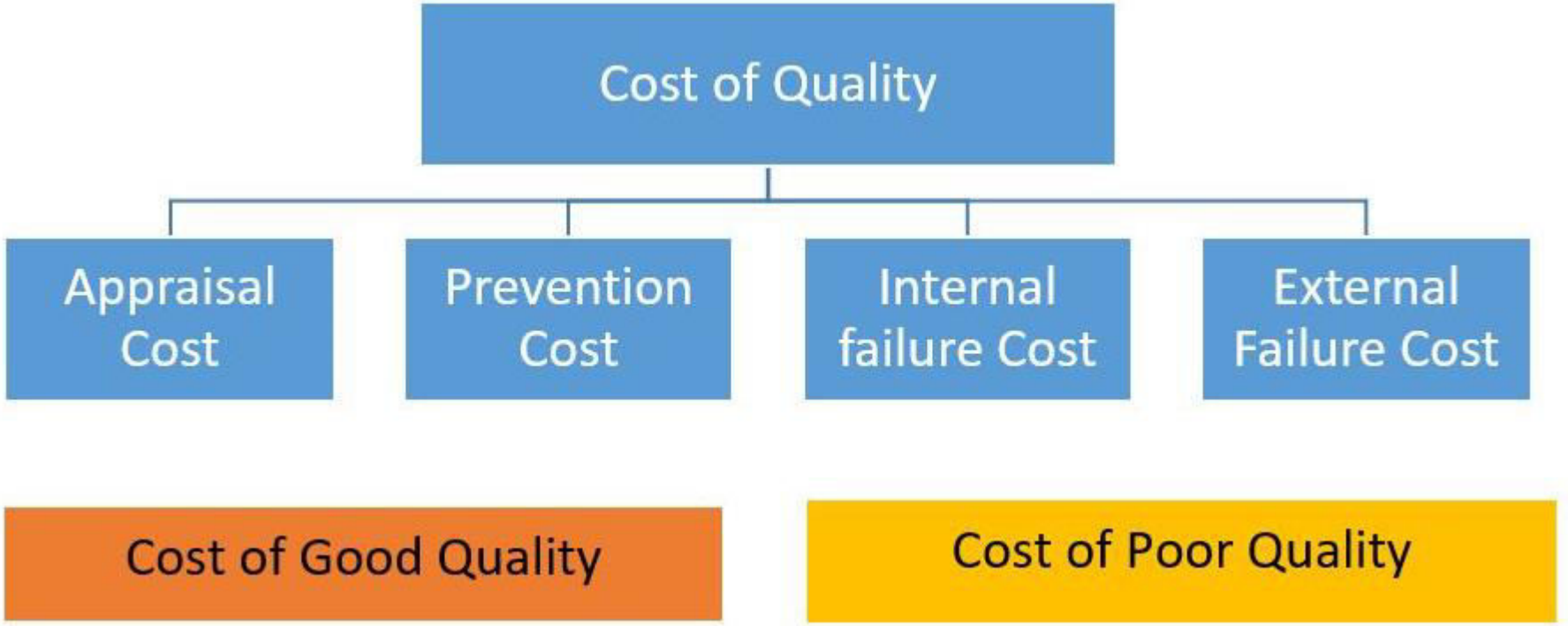
Relation of defects percentage and cost of quality

What is the defect rate percentage?

The percentage of defects in the tests is the number of defective products compared to unit tests. If a unit has 10 out of 200 defects the defect rate is 10 divided by 200 or 5%. Defect rates are usually stated as defects in millions. For example, if you have a 4% defect rate, the defects per million are 40,000

Cost of Quality

Quality is the degree to which an object or entity (e.g., process, product, or service) satisfies a specified set of attributes or requirements.



QUESTIONS.....

APPAREL PRODUCTION PLANNING, SCHEDULING AND QUALITY CONTROL

Question Bank

QUESTIONS.....

- Find the odd one out

a) Production
b) productivity
b) Efficiency
d) quality

- Which is fastest production system among following

a) PBS
b) MPS
b) UPS
d) NONE

- Which produces best quality among following production system:

a) PBS
b) MPS
b) UPS
d) NONE

Very Short question

- Define production
- Define productivity
- Expend PBS
- Expend WIP

Short question

- List the features of PBS
- Write a short note on line balancing
- Discuses about bottle neck

Which of the following functions of Production Planning and Control is related to the timetable of activities?

a) Scheduling
b) Dispatching
c) Expediting
d) Routing

Answer: a

Which of the following processes is not a part of the Production Planning and Control system?

a) Integration of processes
b) Routing
c) Expediting and follow up
d) All of the above

Answer: a

The objectives of Production Planning and Control are _____.

a) Timely delivery of goods and services
b) Improving customer satisfaction
c) Coordinating with multiple departments to ensure that the production process is on track
d) All of the above

Answer: d

The correct sequence of operations in the Production Planning and Control process is _____.

a) Routing – Scheduling – Follow up – Dispatching
b) Scheduling – Follow up – Dispatching – Routing
c) Routing – Scheduling – Dispatching – Follow up
d) Dispatching – Routing – Scheduling – Follow up

Answer: c

Production Planning and Control function is crucial for ensuring cost savings and efficiency in _____.

a) Planning
b) Production
c) Promotion
d) None of the above

Answer: b

The control activity in Production Planning and Control is performed _____ of the plan.

a) Before execution
b) After execution
c) During execution
d) None of the above

Answer: b

_____ involves anticipating bottlenecks in advance and identifying steps that will ensure a smooth flow of production.

a) Production planning
b) Production control
c) Production audit
d) None of the above

Answer: a

Regulating the production process to ensure an orderly flow of materials is the objective of _____.

a) Production planning
b) Production control
c) Production audit
d) None of the above

Answer: b

Production planning is essential for _____.

a) Inventory management
b) Quality management
c) Supply management
d) All of the above

Answer: d

Production control within a company depends on _____.

a) Nature of production activities within the organization
b) Nature of the organization
c) Size of the organization
d) All of the above

Answer: d

_____ is responsible for the order of processing each activity under Production Planning and Control.

a) Loading
b) Sequencing
c) Routing
d) Scheduling

Answer: b

_____ is concerned with the time required to perform each activity under the Production Planning and Control process.

a) Loading
b) Sequencing
c) Routing
d) Scheduling

Answer: d

Material Requirement Planning (MRP) is a computerized system to plan the requirements for _____.

a) Finished goods
b) Raw materials
c) Work in progress
d) All of the above

Answer: d

The process of Production Planning and Control starts with _____.

a) Expediting
b) Scheduling
c) Estimating
d) Routing

Answer: c

The machines used for mass production are _____.

a) Special purpose
b) General-purpose
c) Manually operated
d) Semi-automatic

Answer: d